User's Guide to CLShanCommands

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Preface

I wrote this User's Guide to help you to understand my \newcommands system in the clshan-math (Chapters 1 and 2), the clshan-matrix (Chapter 3), the clshan-YoungTableaux (Chapter 4), the clshan-beamer (Chapter 6), the clshan-color (Chapter 7) and the clshan-font (Chapter 8) packages and to use them conveniently. You can just take my definitions of these \newcommands, if you like them. Or, if you have some better ideas, you can also modify some of my definitions to your favorite style. By the way, if you want, please share me your good ideas.

On the other hand, you have two ways to use my whole packages. If you just use LaTeX 2.09, you have to delete (or at least add a % at the beginning of) the second and the third lines (\ProvidesPackage{clshan-xxxxxx} and \NeedsTeXFormat{LaTeX2e}) in the .sty files and save them as .tex files. Then you can copy or link the .tex files in the dictionary in which you work and input or include them to your own files.

If you use LaTeX 2_ε instead of LaTeX 2.09 (you use \documentclass instead of \documentstyle in the first line of your LaTeX files), it must be a better and more convenient way to use the \usepackage{clshan-xxxxxx} command. If you use WinEdt with MiKTeX to compile your .tex files, you can put the clshan-xxxxxx.sty files in a, for example, C:\MiKTeX\tex\latex\clshan\ dictionary, and then open the MiKTeX Options in the Accessories in the WinEdt Toolbar to Refresh the Files name database. Then you can use the \usepackage{clshan-xxxxxx} command directly.

Finally, if you find this **User's Guide to CLShanCommands** too thick to read (since Version 4.0 it is already more than one hundred pages) and just want a quick view of my \newcommands and their examples, it is convenient for you to look my CLShanCmds-Examples-Math.pdf file for my mathematical symbols in Chapter 2, and my CLShanCmds-Examples-Matrix.pdf file for the matrices in Chapter 3.

Improvements:

In Version 2.1, I added a few \newcommands in Sections 2.3 and 2.15.

In Version 3.0, I added more \newcommands in Sections 1.3, 1.4, and 2.14. Meanwhile, in order to use the \newcommands in Section 1.3 in the beamer class, I redefined them in the clshan-beamer package (Section 6.2).

In Version 3.1, I added a few \newcommands in Section 2.3.

In Version 4.0, I completed my "a-b-c-v-n-s" and "A-B-C-V-N" systems for brackets, absolute values, norms, and square roots in Section 2.3, for ordinary differentiations in Section 2.6, for partial differentiations in Section 2.7, and for the operators involving the ∇ in Section 2.8. Moreover, I modified my definitions of the atomic symbols in Section 2.11.

In Version 4.1, I corrected some of my \newcommands for changing equation numbers in Section 1.4.

In Version 4.2, I added two \newcommands for changing equation numbers in Section 1.4.

In Version 5.0, I wrote a new package: clshan-YoungTableaux for drawing the Young Tableaux in Chapter 4, meanwhile I separated my \newcommands for matrices (Chapter 3) from the clshan-math package and rewrote them to the clshan-matrix package. I also added a \newcommand in Section 2.14, and improved some definitions in Sections 2.14 and 6.4.

In Version 07-1.0, I wrote the clshan-color package for using different colors for text and background in Chapter 7 and the clshan-font package for using some special type fonts and some special symbols defined in these fonts in Chapter 8.

In Version 07-1.1, I improved the definitions of the \newcommands for using the special symbols in the different type fonts in the clshan-font package (Section 8.2), in order to ensure that these symbols can be shown correctly in the math mode.

In Version 07-1.2, I improved some definitions of the \newcommands for changing equation numbers in the clshan-math package (Section 1.4), in order to ensure that these commands do not produce extra undesirable space.

In Version 10-1.0, I added some \newcommands for typing different number of letters together under a "/ (slash)" sign in Section 2.13.

In Versions 11-1.0, 11-1.01 and 11-1.1, I added some new defined colors in the clshan-color package (Chapter 7). Meanwhile, Section 9.1 has been updated according to the modification of the definitions of the special \newcommands used in this User's Guide.

Chapter 1

Abbreviations

I defined some abbreviations for the long commands which have been used very often in my `clshan-math` package.

1.1 `displaystyle` and `textstyle`

Sometimes I want to use `\textstyle` in a equation to reduce the size of some big parts of this equation such like:

$$\left[\frac{\sinh^2\left(2\widetilde{K}_{\mathrm{G}}\right)}{2\sqrt{\widetilde{K}_{\mathrm{G}}}}\right]$$

to

$$\left[\frac{\sinh^2\left(2\widetilde{K}_{\mathrm{G}}\right)}{2\sqrt{\widetilde{K}_{\mathrm{G}}}}\right]$$

and sometimes I want to use `\displaystyle` in a `table` or an `array` environment to remain the size of some elements, for example,

$$\left\{\begin{array}{rcl} a & = & \frac{3}{25} \\ b & = & 2 \end{array}\right.$$

as

$$\left\{\begin{array}{rcl} a & = & \displaystyle\frac{3}{25} \\ b & = & 2 \end{array}\right.$$

I'm lazy to type a long command and it is also easy to make a typing mistake. Hence, I defined two abbreviations for them:

Definitions

```
\newcommand{\D}                 {\displaystyle}

\newcommand{\T}                 {\textstyle}
```

1.2 `equation` and `eqnarray` environments

For the `equation` and `eqnarray` environments with equation numbers, I defined the following abbreviations:

Definitions

```
\newcommand{\beq}               {\begin{equation}}

\newcommand{\eeq}               {\end{equation}  }
```

```
\newcommand{\beqn}              {\begin{eqnarray}}

\newcommand{\eeqn}              {\end{eqnarray}  }
```

On the other hand, for cases without equation numbers, I added an "N" to indicate "no number":

Definitions

```
\newcommand{\beqN}              {\[              }

\newcommand{\eeqN}              {\]              }
```

```
\newcommand{\beqnN}             {\begin{eqnarray*}}

\newcommand{\eeqnN}             {\end{eqnarray*}  }
```

It seems a little more complicated to define longer commands for `\[` and `\]`. But, sometimes I used the `equation` environment at first and then found that there are too many equation numbers. I decided to reduce the number of `equation` and deleted some couples of `\begin{equation}` and `\end{equation}` and replace them to `\[` and `\]`. However, I found later that I have deleted some equation numbers which I actually need. So I must invert the above process: delete some couples of `\[` and `\]` and then replace them to `\begin{equation}` and `\end{equation}`. It is too tired and seems stupid. Hence, I defined these two commands for `\[` and `\]`. Then I just need to delete or add an N! Moreover, I defined

Definition

```
\newcommand{\non}               {\nonumber}
```

and

Definitions

```
\renewcommand{\&}               {& \hspace{-1.3ex}}

\renewcommand{\=}               {& \hspace{-1.3ex} = & \hspace{-1.3ex}}
```

for the `eqnarray` environment. Because the space on the both sides of the "=" sign in the `eqnarray` environment is too large and I want that they have the same width as in the `equation` environment. Furthermore, I defined

Definition

```
\renewcommand{\~}               {~\!}
```

for a smaller space than `~`. Note here that I *redefined* these three commands (the only three commands which I redefined) `\&`, `\=`, and `\~` (their original definitions are &, ā, and ã). But, I thought that it is pretty natural to use such names for the `\newcommand`s which have been considered to replace the commands: `&`, `&=&`, and `~`. On the other hand, I use their original definitions in fact very seldom. Thus these definitions are very convenient for me, and, when I need to type &, ā, and ã (like here), I can use the following replacements:

Symbols	Original commands in LaTeX	My replacements
&	\&	\symbol{38}
ā	\={a}	$\bar{\rm a}$
ã	\~{a}	$\tilde{\rm a}$

Finally, I defined an abbreviation for writing my note conveniently:

Definition

```
\newcommand{\then}              {\Longrightarrow ~~}
```

Example

$\Longrightarrow$	\then

Below I give you an example to show you how to combine these \newcommands.

Example

```
\beqn
\then
                \sin x
 \=             \sum_{k=0}^{\infty} \frac{(-1)^{k} \~ x^{2k+1}}{(2k+1)!}
                \non\\
 \&\approx\&    x-\frac{x^3}{6}+\frac{x^5}{120}
\eeqn
```

$$\Longrightarrow \quad \sin x = \sum_{k=0}^{\infty} \frac{(-1)^k \, x^{2k+1}}{(2k+1)!} \approx x - \frac{x^3}{6} + \frac{x^5}{120} \tag{1}$$

1.3 More \newcommands for the eqnarray environment

At first I redefined the \& command in LaTeX (see Section 1.2) in order to reduce the default space when we use an & in the eqnarray environment. Then I redefined the \= command for the longer command \&=\& because I used it very very often. Due to the convenience of this (re)definition, I decide now to define the following \newcommands for all binary relation which we can use in the eqnarray environment:

Definitions

```
\newcommand{\eqnneq}            {& \hspace{-1.3ex} \neq    & \hspace{-1.3ex}}

\newcommand{\eqnne}             {& \hspace{-1.3ex} \ne     & \hspace{-1.3ex}}
```

```
\newcommand{\eqnleq}          {& \hspace{-1.3ex} \leq    & \hspace{-1.3ex}}
\newcommand{\eqnle}           {& \hspace{-1.3ex} \le     & \hspace{-1.3ex}}
```

```
\newcommand{\eqngeq}          {& \hspace{-1.3ex} \geq    & \hspace{-1.3ex}}
\newcommand{\eqnge}           {& \hspace{-1.3ex} \ge     & \hspace{-1.3ex}}
```

```
\newcommand{\eqnll}           {& \hspace{-1.3ex} \ll     & \hspace{-1.3ex}}
\newcommand{\eqngg}           {& \hspace{-1.3ex} \gg     & \hspace{-1.3ex}}
```

```
\newcommand{\eqnequiv}        {& \hspace{-1.3ex} \equiv   & \hspace{-1.3ex}}
\newcommand{\eqndoteq}        {& \hspace{-1.3ex} \doteq   & \hspace{-1.3ex}}
```

```
\newcommand{\eqncong}         {& \hspace{-1.3ex} \cong    & \hspace{-1.3ex}}
\newcommand{\eqnapprox}       {& \hspace{-1.3ex} \approx  & \hspace{-1.3ex}}
```

```
\newcommand{\eqnsimeq}        {& \hspace{-1.3ex} \simeq   & \hspace{-1.3ex}}
\newcommand{\eqnsim}          {& \hspace{-1.3ex} \sim     & \hspace{-1.3ex}}
```

```
\newcommand{\eqnpropto}       {& \hspace{-1.3ex} \propto  & \hspace{-1.3ex}}
```

where the "eqn" stands for the ''eqn''array environment. As an example I rewrite the last example in Section 1.2 as following:

Example

```
\beqn
\then
             \sin x
 \=          \sum_{k=0}^{\infty} \frac{(-1)^{k} \~ x^{2k+1}}{(2k+1)!}
             \non\\
 \eqnapprox  x-\frac{x^3}{6}+\frac{x^5}{120}
\eeqn
```

Meanwhile, for a longer equation such like

$$\begin{aligned}\frac{\sinh^2 x - x^2}{x^2\ \sinh^2 x} &= \cdots \\ &= \left(\frac{1}{3}+\frac{2x^2}{45}+\frac{x^4}{315}+\cdots\right) \\ &\qquad \times \left[1 - x^2\left(\frac{1}{3}+\frac{2x^2}{45}+\frac{x^4}{315}+\cdots\right) + x^4\left(\frac{1}{3}+\frac{2x^2}{45}+\frac{x^4}{315}+\cdots\right)^2 - + \cdots\right]\end{aligned}$$

I usually use a command \&~\& for the last line. Because I have already used (redefined) the command \~ for ~\! (see Section 1.2), I define the following \newcommand:

Definition

```
\newcommand{\conti}            {& \hspace{-1.3ex} ~       & \hspace{-1.3ex}}
```

where the "conti" stands for "continue". As an example I give you the commands for the last two lines of the above equation here:

Example

```
\=     \left(......\right)
       \non\\
\conti ~~~~~~ \times
       \left[1-x^2 ......\right]
```

Furthermore, for the case in which you want to put something else instead of a normal binary relation in the `eqnarray` or `eqnarray*` environments, I defined also a `\newcommand` here:

Definition

```
\newcommand{\eqnBinary}    [1]  {& \hspace{-1.3ex} #1      & \hspace{-1.3ex}}
```

Then we can rewrite the three commands which I used as examples above as following:

Examples

```
\=                      \eqnBinary{=}

\eqnapprox              \eqnBinary{\approx}

\conti                  \eqnBinary{~}
```

1.4 Changing equation numbers

Sometimes we want to label the equation number of two equations as following:

$$\sin x = \frac{e^{ix} - e^{-ix}}{2i} = x - \frac{x^3}{6} + \frac{x^5}{120} - + \cdots \tag{4a}$$

$$\cos x = \frac{e^{ix} + e^{-ix}}{2} = 1 - \frac{x^2}{2} + \frac{x^4}{24} - + \cdots \tag{4b}$$

Formally, for such cases, we use a command `\renewcommand{\theequation}{\arabic{equation}a}` at first, and then commands `\addtocounter{equation}{-1}` and `\renewcommand{\theequation}{\arabic{equation}b}` between these two equations, finally, we use `\renewcommand{\theequation}{\arabic{equation}}` to change the label of the equation number back. Such a combination is almost fixed and we need it maybe pretty frequently. For sure we can just copy them every time. But I think it is better to define some short `\newcommand`s.

Definitions

```
\newcommand{\cheqn}             {\renewcommand{\theequation}{\arabic{equation}}}
\newcommand{\cheqnx}       [1]  {\renewcommand{\theequation}{\arabic{equation}#1}}
```

```
\newcommand{\cheqnN}       [1]  {\addtocounter{equation}{#1}%
                                  \renewcommand{\theequation}{\arabic{equation}}}
\newcommand{\cheqnNx}      [2]  {\addtocounter{equation}{#1}%
                                  \renewcommand{\theequation}{\arabic{equation}#2}}
```

Here the "ch" "eq" "n" stand for "change" "equation" "number", with an "x" means you want to add something after the number, for example a and b above, with an "N" means you want to change the equation number before the Roman letter. Meanwhile, because we usually use a, b, and/or c after the number, I defined directly the following `\newcommand`s for them:

Definitions

```
\newcommand{\cheqna}            {\renewcommand{\theequation}{\arabic{equation}a}}
\newcommand{\cheqnb}            {\addtocounter{equation}{-1}%
                                  \renewcommand{\theequation}{\arabic{equation}b}}
\newcommand{\cheqnc}            {\addtocounter{equation}{-1}%
                                  \renewcommand{\theequation}{\arabic{equation}c}}
```

Then, for the two equations above, I just need the following three simple commands:

Examples

```
\cheqnNx{3}{a}
\cheqnb
\cheqn
```

On the other hand, if you want to label the equation number like

$$\sin x = \frac{e^{ix} - e^{-ix}}{2i} = x - \frac{x^3}{6} + \frac{x^5}{120} - + \cdots \tag{def 4a}$$

$$\cos x = \frac{e^{ix} + e^{-ix}}{2} = 1 - \frac{x^2}{2} + \frac{x^4}{24} - + \cdots \tag{def 4b}$$

I have also defined some `\newcommand`s for such cases:

Definitions

```
\newcommand{\cheqnX}       [1]  {\renewcommand{\theequation}{#1\arabic{equation}}}
\newcommand{\cheqnXx}      [2]  {\renewcommand{\theequation}{#1\arabic{equation}#2}}
```

```
\newcommand{\cheqnXN}      [2]  {\addtocounter{equation}{#2}%
                                  \renewcommand{\theequation}{#1\arabic{equation}}}
\newcommand{\cheqnXNx}     [3]  {\addtocounter{equation}{#2}%
                                  \renewcommand{\theequation}{#1\arabic{equation}#3}}
```

```
\newcommand{\cheqnXa}      [1]  {\renewcommand{\theequation}{#1\arabic{equation}a}}
\newcommand{\cheqnXb}      [1]  {\addtocounter{equation}{-1}%
                                  \renewcommand{\theequation}{#1\arabic{equation}b}}
\newcommand{\cheqnXc}      [1]  {\addtocounter{equation}{-1}%
                                  \renewcommand{\theequation}{#1\arabic{equation}c}}
```

where the "X" indicates that you can (have to) give a name for these equations, for example the "def" above. Note here that whether there the "X" "N" and "x" is and their order in these `\newcommand`s can remind you how to give the arguments. For the two equations above, I can use the following three commands:

Examples

```
\cheqnXNx{def }{3}{a}
\cheqnXb{def }
\cheqnX{def }
```

Because we usually use the commands `\cheqn` and `\cheqnX` to change the label of the equation number back, I also gave each of them an other name:

Definitions

```
\newcommand{\reeqn}            {\renewcommand{\theequation}{\arabic{equation}}}
\newcommand{\reeqnX}      [1]  {\renewcommand{\theequation}{#1\arabic{equation}}}
```

where the "re" stands for "return". Then the two examples above can be rewritten as

Examples

```
\cheqnNx{3}{a}
\cheqnb
\reeqn
```

```
\cheqnXNx{def }{3}{a}
\cheqnXb{def }
\reeqnX{def }
```

Finally, sometimes we label an equation and use it later:

$$\sin x = x - \frac{x^3}{6} + \frac{x^5}{120} + - \cdots \tag{4a}$$

or, sometimes we change this equation a little bit:

$$\sin x \approx 1 - \frac{x^3}{6} + \frac{x^5}{120} \tag{4a'}$$

Hence I defined the following three `\newcommand`s:

Definitions

```
\newcommand{\cheqnref}     [1]  {\renewcommand{\theequation}{\ref{#1}}}
\newcommand{\cheqnrefp}    [1]  {\renewcommand{\theequation}{\ref{#1}'}}
\newcommand{\cheqnrefdp}   [1]  {\renewcommand{\theequation}{\ref{#1}''}}
```

where the "ref" stands for the LaTeX command `\ref`, "p" stands for "prime", and "dp" stands for "double prime". For the second equation above, I can use the following two commands:

Examples

```
\cheqnrefp{04a}
\cheqnN{-1}
```

Note that I used `\cheqnN` above in order to correct the "counter" of the equation number.

1.5 Suggestions for the `equation` and `eqnarray` environments

In this and the next section, I will suggest you some convenient definitions of `\newcommand`s, but, please note that they are not defined in my `clshan-math` package. If you need them pretty often, you can certainly add them into my file or your own `\newcommand`s-file.

First, some people prefer to use shorter commands for the `equation`, `eqnarray`, and `eqnarray*` environment:

Definitions

```
\newcommand{\be}              {\begin{equation} }
\newcommand{\ee}              {\end{equation}   }
```

```
\newcommand{\beq}             {\begin{eqnarray} }
\newcommand{\eeq}             {\end{eqnarray}   }
```

```
\newcommand{\beqn}            {\begin{eqnarray*}}
\newcommand{\eeqn}            {\end{eqnarray*}  }
```

Actually, you can use the following commands to reduce each pair commands for one environment to just one:

Definitions

```
\newcommand{\eqin}        [1]  {\begin{equation}  #1 \end{equation} }
\newcommand{\eqnin}       [1]  {\begin{eqnarray}  #1 \end{eqnarray} }
\newcommand{\eqNin}       [1]  {\begin{eqnarray*} #1 \end{eqnarray*}}
```

Moreover, if you label your equations very often, then the following commands seem very convenient for you:

Definitions

```
\newcommand{\eqlabel}     [2]  {\begin{equation} #1 \label{eqn:#2} \end{equation}}
\newcommand{\eqnlabel}    [2]  {\begin{eqnarray} #1 \label{eqn:#2} \end{eqnarray}}
```

Example

```
\eqnlabel{
\then
               \sin x
 \=            \sum_{k=0}^{\infty} \frac{(-1)^{k} \~ x^{2k+1}}{(2k+1)!}
               \non\\
 \&\approx\&  x-\frac{x^3}{6}
}
{203}
```

1.6 Suggestions for the `figure` and `table` environments

Similar to my Suggestions for the `equation` and `eqnarray` environments, you can use

Definitions

```
\newcommand{\bfig}              {\begin{figure} }

\newcommand{\efig}              {\end{figure}   }
```

```
\newcommand{\bfigs}             {\begin{figure*}}

\newcommand{\efigs}             {\end{figure*}  }
```

for the `figure` and `figure*` environments, and

Definitions

```
\newcommand{\btab}              {\begin{table} }

\newcommand{\etab}              {\end{table}   }
```

```
\newcommand{\btabs}             {\begin{table*}}

\newcommand{\etabs}             {\end{table*}  }
```

for the `table` and `table*` environments. Note that the "s" in the above commands stands for "star ($*$)". On the other hand, you can also define just one command for an environment:

Definitions

```
\newcommand{\figin}        [1]  {\begin{figure}  #1 \end{figure} }

\newcommand{\figsin}       [1]  {\begin{figure*} #1 \end{figure*}}
```

```
\newcommand{\tabin}        [1]  {\begin{table}   #1 \end{table}  }

\newcommand{\tabsin}       [1]  {\begin{table*}  #1 \end{table*} }
```

Moreover, you can also combine the `\label` command as following:

Definitions

```
\newcommand{\figlabel}     [2]  {\begin{figure } #1 \label{fig:#2} \end{figure }}
\newcommand{\figslabel}    [2]  {\begin{figure*} #1 \label{fig:#2} \end{figure*}}
```

```
\newcommand{\tablabel}     [2]  {\begin{table}   #1 \label{tab:#2} \end{table}  }
\newcommand{\tabslabel}    [2]  {\begin{table*}  #1 \label{tab:#2} \end{table*} }
```

or, even also combine the `\caption` command:

Definitions

```
\newcommand{\figlabelcap}  [3]  {\begin{figure}  #1 \label{fig:#2} \caption{#3} \end{figure} }
\newcommand{\figslabelcap} [3]  {\begin{figure*} #1 \label{fig:#2} \caption{#3} \end{figure*}}
```

```
\newcommand{\tablabelcap}  [3]  {\begin{table}   #1 \label{tab:#2} \caption{#3} \end{table}  }
\newcommand{\tabslabelcap} [3]  {\begin{table*}  #1 \label{tab:#2} \caption{#3} \end{table*} }
```

Example

```
\figlabelcap{
[p]
\begin{center}
\begin{picture}(10,10)
\put(2,2){\framebox(6,6){Sample}}
\end{picture}
\end{center}
}
{2a}
{A sample picture.}
```

Chapter 2

Mathematical Symbols

I defined pretty lots of `\newcommand`s for long series of commands which I used very often and a few `\newcommand`s for some special functions in my `clshan-math` package. I will give you my new commands, explain their names (to help you better to remember these commands). I will also give you examples for these `\newcommand`s.

2.1 Special functions

Some special functions have not been defined in LaTeX, e.g., `\sech` or `\csch`. I defined a part of them (not all of them!) when I had to use such functions. First, the two hyperbolic functions mentioned above have been defined as following, respectively:

Definitions

```
\newcommand{\sech}              {{\rm sech}                          }
\newcommand{\sechx}       [1]   {{\rm sech}      \hspace{0.375ex} #1}
\newcommand{\sechn}       [1]   {{\rm sech^{#1}}                      }
\newcommand{\sechnx}      [2]   {{\rm sech^{#1}} \hspace{0.385ex} #2}
```

```
\newcommand{\csch}              {{\rm csch}                          }
\newcommand{\cschx}       [1]   {{\rm csch}      \hspace{0.375ex} #1}
\newcommand{\cschn}       [1]   {{\rm csch^{#1}}                      }
\newcommand{\cschnx}      [2]   {{\rm csch^{#1}} \hspace{0.385ex} #2}
```

Here I defined two commands `\sech` and `\sechx` for sech function. Because, for the other LaTeX defined special functions, the space between the function, sech, and the argument such like x is a little bigger than that between sech and the argument, for example, (x). Meanwhile, I also defined two commands `\sechn` and `\sechnx` for powers of the sech function, because we also need an a little bigger space between sech^2 and x than (x). Moreover, if we use a command such like `\sechx{^2 x}`, than we will get $\mathrm{sech}^2 x$, the space stands between the function sech and the power 2, not what we want: between the function with the power 2, sech^2 and the argument x. Below I give you examples for every defined commands above to let you understand the differences.

Examples

$\sech x$	`\sechx{x}`
$\sech(x)$	`\sech(x)`
$\sech^{k} x$	`\sechnx{k}{x}`
$\sech^{k}(x)$	`\sechn{k}(x)`

$\csch x$	`\cschx{x}`
$\csch(x)$	`\csch(x)`
$\csch^{k} x$	`\cschnx{k}{x}`
$\csch^{k}(x)$	`\cschn{k}(x)`

On the other hand, I also defined the error functions:

Definitions

```
\newcommand{\erf}              {{\rm erf }}
\newcommand{\erfc}             {{\rm erfc}}
```

and the Airy functions:

Definitions

```
\newcommand{\Ai}               {{\rm Ai}}
\newcommand{\Bi}               {{\rm Bi}}
```

Examples

$\erf(x)$	`\erf(x)`
$\erfc(x)$	`\erfc(x)`

$\Ai(x)$	`\Ai(x)`
$\Bi(x)$	`\Bi(x)`

2.2 Brackets, absolute values, norms, and square roots involving a fraction

2.2.1 A positive fraction

I typed some series of commands for a bracket involving a fraction very often, for example,

$$\left(\frac{f}{g}\right)$$

where the command: `\left(\frac{f}{g}\right)` has been used. If I want to rewrite these two functions, f and g, to $f(x)$ and $g(x)$ later, this means that I need to change the parentheses `( )` for the fraction to a pair of bracket `[ ]`:

$$\left[\frac{f(x)}{g(x)}\right]$$

This means also that I must keep to push the ▷ key a while... I'm lazy to do such thing again and again (even just to write some long series of commands once). Hence, I defined the following `\newcommand`s for different brackets involving a fraction:

Definitions

```
\newcommand{\afrac}       [2]  {\left (    \frac{#1}{#2} \right )   }
\newcommand{\bfrac}       [2]  {\left [    \frac{#1}{#2} \right ]   }
\newcommand{\cfrac}       [2]  {\left\{    \frac{#1}{#2} \right\}   }
```

```
\newcommand{\vfrac}       [2]  {\left |    \frac{#1}{#2} \right |   }
\newcommand{\nfrac}       [2]  {\left\Vert \frac{#1}{#2} \right\Vert}
```

```
\newcommand{\sfrac}       [2]  {\sqrt {    \frac{#1}{#2}        }   }
```

Here "a", "b", and "c" correspond to `( )`, `[ ]`, and `{ }`, respectively, "v" stands for the LaTeX command for `|`: "`\vert`", "n" stands for "norm", and "s" for "square root" or the LaTeX command for square root: "`\sqrt`". Now what I need to do is just to type or change the letter before `frac`!

Examples

$\left(\frac{f}{2}\right)$ `\afrac{f}{2}`

$\left[\frac{f(x)}{2}\right]$ `\bfrac{f(x)}{2}`

$\left\{\frac{f(x)[\cdots]}{2}\right\}$ `\cfrac{f(x) [\cdots]}{2}`

$\left|\frac{f(x)}{2}\right|$ `\vfrac{f(x)}{2}`

$\left\|\frac{f(x)}{2}\right\|$ `\nfrac{f(x)}{2}`

$\sqrt{\frac{f(x)}{2}}$ `\sfrac{f(x)}{2}`

On the other hand, sometimes I want to make, for example, the first parentheses in the equation below larger to look more suitable for the later one:

$$\left(\frac{3}{xy}\right)\left(\frac{e^{ax^2+bx+c}}{y^{2/3}}\right)$$

For this aim I have to use the command `\Bigg(\frac{3}{xy}\Bigg)`. Hence, it seems better for me to define some `\newcommand`s for such necessities.

Definitions

```
\newcommand{\Afrac}       [2]  {\Bigg (    \frac{#1}{#2} \Bigg )   }
\newcommand{\Bfrac}       [2]  {\Bigg [    \frac{#1}{#2} \Bigg ]   }
\newcommand{\Cfrac}       [2]  {\Bigg\{    \frac{#1}{#2} \Bigg\}   }
```

```
\newcommand{\Vfrac}       [2]  {\Bigg |    \frac{#1}{#2} \Bigg |   }
\newcommand{\Nfrac}       [2]  {\Bigg\Vert \frac{#1}{#2} \Bigg\Vert}
```

Here I used the capital letters: "A", "B", "C", "V", and "N" to indicate that, first, they are the partner-commands for `\afrac`, `\bfrac`, etc.; second, the common effect of these commands is to make the brackets *larger*. Please note that there is *no* such command like `\Sfrac`.

Examples

$\left(\frac{f}{2}\right)$ `\Afrac{f}{2}`

$\left[\frac{f(x)}{2}\right]$ `\Bfrac{f(x)}{2}`

$\left\{\frac{f(x)[\cdots]}{2}\right\}$ `\Cfrac{f(x) [\cdots]}{2}`

$\left|\frac{f(x)}{2}\right|$ `\Vfrac{f(x)}{2}`

$\left\|\frac{f(x)}{2}\right\|$ `\Nfrac{f(x)}{2}`

2.2.2 A negative fraction

Sometimes I have to put a minus sign "−" in front of a fraction involved in brackets, so I defined these `\newcommand`s:

Definitions

```
\newcommand{\amfrac}      [2]  {\left (    -\frac{#1}{#2}\right )   }
\newcommand{\bmfrac}      [2]  {\left [    -\frac{#1}{#2}\right ]   }
\newcommand{\cmfrac}      [2]  {\left\{    -\frac{#1}{#2}\right\}   }
```

```
\newcommand{\vmfrac}      [2]  {\left |    -\frac{#1}{#2}\right |   }
\newcommand{\nmfrac}      [2]  {\left\Vert -\frac{#1}{#2}\right\Vert}
```

```
\newcommand{\smfrac}      [2]  {\sqrt {    -\frac{#1}{#2}       }   }
```

and, similarly, in order to enlarge the brackets, I defined

Definitions

```
\newcommand{\Amfrac}      [2]  {\Bigg ( \hspace{-0.5ex}-\hspace{-0.5ex} \frac{#1}{#2} \Bigg )}
\newcommand{\Bmfrac}      [2]  {\Bigg [ \hspace{-0.5ex}-\hspace{-0.5ex} \frac{#1}{#2} \Bigg ]}
\newcommand{\Cmfrac}      [2]  {\Bigg\{ \hspace{-0.5ex}-\hspace{-0.5ex} \frac{#1}{#2} \Bigg\}}
```

```
\newcommand{\Vmfrac}      [2]  {\Bigg | \hspace{-0.5ex}-\hspace{-0.5ex} \frac{#1}{#2} \Bigg |}
\newcommand{\Nmfrac}      [2]  {\Bigg\Vert \hspace{-0.5ex}-\hspace{-0.5ex} \frac{#1}{#2} \Bigg\Vert}
```

Examples

$\left(-\frac{f}{2}\right)$ `\amfrac{f}{2}`

$\left[-\frac{f(x)}{2}\right]$ `\bmfrac{f(x)}{2}`

$\left\{-\frac{f(x)[\cdots]}{2}\right\}$ `\cmfrac{f(x) [\cdots]}{2}`

$\left|-\frac{f(x)}{2}\right|$ `\vmfrac{f(x)}{2}`

$\left\|-\frac{f(x)}{2}\right\|$ `\nmfrac{f(x)}{2}`

$\sqrt{-\frac{f(x)}{2}}$ `\smfrac{f(x)}{2}`

$$\left(-\frac{f}{2}\right)$$ `\Amfrac{f}{2}`

$$\left[-\frac{f(x)}{2}\right]$$ `\Bmfrac{f(x)}{2}`

$$\left\{-\frac{f(x)[\cdots]}{2}\right\}$$ `\Cmfrac{f(x) [\cdots]}{2}`

$$\left|-\frac{f(x)}{2}\right|$$ `\Vmfrac{f(x)}{2}`

$$\left\|-\frac{f(x)}{2}\right\|$$ `\Nmfrac{f(x)}{2}`

2.3 Brackets, absolute values, and norms involving an arbitrary argument

2.3.1 In normal size

After that I had defined some simple `\newcommand`s for the brackets, absolute values, norms and square roots involving a fraction, I found that it is very convenient to use this "a-b-c-v-n-s" system. Hence, I decided to follow it to define more `\newcommand`s.

Definitions

```
\newcommand{\abrac}       [1]  {\left (    #1 \right )   }
\newcommand{\bbrac}       [1]  {\left [    #1 \right ]   }
\newcommand{\cbrac}       [1]  {\left\{    #1 \right\}   }
```

```
\newcommand{\vbrac}       [1]  {\left |    #1 \right |   }
\newcommand{\nbrac}       [1]  {\left\Vert #1 \right\Vert}
```

Here "a", "b", and "c" correspond to `( )`, `[ ]`, and `{ }`, respectively, "v" stands for the LaTeX command for `|`: "`\vert`", "n" stands for "norm".

Examples

$$\left(x^2\right)$$ `\abrac{x^2}`

$$\left[x^2\right]$$ `\bbrac{x^2}`

$$\left\{x^2\right\}$$ `\cbrac{x^2}`

$\left\vert x^2 \right\vert$	`\vbrac{x^2}`
$\left\Vert x^2 \right\Vert$	`\nbrac{x^2}`

On the other hand, sometimes we need brackets, absolute values or norms with just one side, thus I defined the following `\newcommand`s. For cases with the left side,

Definitions

```
\newcommand{\aleft}       [1]  {\left (    #1 \right.}
\newcommand{\bleft}       [1]  {\left [    #1 \right.}
\newcommand{\cleft}       [1]  {\left\{    #1 \right.}
```

```
\newcommand{\vleft}       [1]  {\left |    #1 \right.}
\newcommand{\nleft}       [1]  {\left\Vert #1 \right.}
```

and for cases with the right side,

Definitions

```
\newcommand{\aright}      [1]  {\left. #1 \right )   }
\newcommand{\bright}      [1]  {\left. #1 \right ]   }
\newcommand{\cright}      [1]  {\left. #1 \right\}   }
```

```
\newcommand{\vright}      [1]  {\left. #1 \right |   }
\newcommand{\nright}      [1]  {\left. #1 \right\Vert}
```

Examples

$\left(x^2 \right.$	`\aleft{x^2}`
$\left[x^2 \right.$	`\bleft{x^2}`
$\left\{ x^2 \right.$	`\cleft{x^2}`

$\left\vert x^2 \right.$	`\vleft{x^2}`
$\left\Vert x^2 \right.$	`\nleft{x^2}`

$x^2 \left. \right)$	`\aright{x^2}`
$x^2 \left. \right]$	`\bright{x^2}`
$x^2 \left. \right\}$	`\cright{x^2}`

$x^2\vert$	`\vright{x^2}`
$x^2\Vert$	`\nright{x^2}`

2.3.2 Enlarging brackets, absolute values or norms

For enlarging brackets, absolute values or norms, I have

Definitions

```
\newcommand{\aBig}        [1]  {\Big (    #1 \Big )   }
\newcommand{\bBig}        [1]  {\Big [    #1 \Big ]   }
\newcommand{\cBig}        [1]  {\Big\{    #1 \Big\}   }
```

```
\newcommand{\vBig}        [1]  {\Big |    #1 \Big |   }
\newcommand{\nBig}        [1]  {\Big\Vert #1 \Big\Vert}
```

where "Big" stands for the LaTeX command `\Big`. Certainly, I defined `\newcommand`s which correspond to the commands `\big`, `\bigg`, and `\Bigg` at the same time.

Definitions

```
\newcommand{\abig}        [1]  {\big (    #1 \big )   }
\newcommand{\bbig}        [1]  {\big [    #1 \big ]   }
\newcommand{\cbig}        [1]  {\big\{    #1 \big\}   }
\newcommand{\vbig}        [1]  {\big |    #1 \big |   }
\newcommand{\nbig}        [1]  {\big\Vert #1 \big\Vert}
```

```
\newcommand{\abigg}       [1]  {\bigg (    #1 \bigg )   }
\newcommand{\bbigg}       [1]  {\bigg [    #1 \bigg ]   }
\newcommand{\cbigg}       [1]  {\bigg\{    #1 \bigg\}   }
\newcommand{\vbigg}       [1]  {\bigg |    #1 \bigg |   }
\newcommand{\nbigg}       [1]  {\bigg\Vert #1 \bigg\Vert}
```

```
\newcommand{\aBigg}       [1]  {\Bigg (    #1 \Bigg )   }
\newcommand{\bBigg}       [1]  {\Bigg [    #1 \Bigg ]   }
\newcommand{\cBigg}       [1]  {\Bigg\{    #1 \Bigg\}   }
\newcommand{\vBigg}       [1]  {\Bigg |    #1 \Bigg |   }
\newcommand{\nBigg}       [1]  {\Bigg\Vert #1 \Bigg\Vert}
```

Note here that I *didn't* define a `\newcommand` such like `\ambigg` or `\vmBigg` for enlarging of brackets with arguments having a minus sign.

Examples

$\abig{x}$	`\abig{x}`
$\bbig{x}$	`\bbig{x}`
$\cbig{x}$	`\cbig{x}`
$\vbig{-x}$	`\vbig{-x}`
$\nbig{-x}$	`\nbig{-x}`

$\aBig{x^2}$	`\aBig{x^2}`
$\bBig{x^2}$	`\bBig{x^2}`
$\cBig{x^2}$	`\cBig{x^2}`
$\vBig{-x^2}$	`\vBig{-x^2}`
$\nBig{-x^2}$	`\nBig{-x^2}`

$\abigg{x^2}$	`\abigg{x^2}`
$\bbigg{x^2}$	`\bbigg{x^2}`
$\cbigg{x^2}$	`\cbigg{x^2}`
$\vbigg{-x^2}$	`\vbigg{-x^2}`
$\nbigg{-x^2}$	`\nbigg{-x^2}`

$\aBigg{x^2}$ → `\aBigg{x^2}`

$\bBigg{x^2}$ → `\bBigg{x^2}`

$\cBigg{x^2}$ → `\cBigg{x^2}`

$\vBigg{-x^2}$ → `\vBigg{-x^2}`

$\nBigg{-x^2}$ → `\nBigg{-x^2}`

Furthermore, for cases in which we need brackets, absolute values or norms with just one side, you just have to add an "l" denoting "left" to the above `\newcommand`s.

Definitions

```
\newcommand{\abigl}       [1]  {\big (    #1 \big.}
\newcommand{\bbigl}       [1]  {\big [    #1 \big.}
\newcommand{\cbigl}       [1]  {\big\{    #1 \big.}
\newcommand{\vbigl}       [1]  {\big |    #1 \big.}
\newcommand{\nbigl}       [1]  {\big\Vert #1 \big.}
```

```
\newcommand{\aBigl}       [1]  {\Big (    #1 \Big.}
\newcommand{\bBigl}       [1]  {\Big [    #1 \Big.}
\newcommand{\cBigl}       [1]  {\Big\{    #1 \Big.}
\newcommand{\vBigl}       [1]  {\Big |    #1 \Big.}
\newcommand{\nBigl}       [1]  {\Big\Vert #1 \Big.}
```

```
\newcommand{\abiggl}      [1]  {\bigg (    #1 \bigg.}
\newcommand{\bbiggl}      [1]  {\bigg [    #1 \bigg.}
\newcommand{\cbiggl}      [1]  {\bigg\{    #1 \bigg.}
\newcommand{\vbiggl}      [1]  {\bigg |    #1 \bigg.}
\newcommand{\nbiggl}      [1]  {\bigg\Vert #1 \bigg.}
```

```
\newcommand{\aBiggl}       [1]  {\Bigg (    #1 \Bigg.}
\newcommand{\bBiggl}       [1]  {\Bigg [    #1 \Bigg.}
\newcommand{\cBiggl}       [1]  {\Bigg\{    #1 \Bigg.}
\newcommand{\vBiggl}       [1]  {\Bigg |    #1 \Bigg.}
\newcommand{\nBiggl}       [1]  {\Bigg\Vert #1 \Bigg.}
```

and, for the right side cases, you can replace the "l" by a "r" denoting "right" to the above `\newcommand`s.

Definitions

```
\newcommand{\abigr}        [1]  {\big. #1 \big )   }
\newcommand{\bbigr}        [1]  {\big. #1 \big ]   }
\newcommand{\cbigr}        [1]  {\big. #1 \big\}   }
\newcommand{\vbigr}        [1]  {\big. #1 \big |   }
\newcommand{\nbigr}        [1]  {\big. #1 \big\Vert}
```

```
\newcommand{\aBigr}        [1]  {\Big. #1 \Big )   }
\newcommand{\bBigr}        [1]  {\Big. #1 \Big ]   }
\newcommand{\cBigr}        [1]  {\Big. #1 \Big\}   }
\newcommand{\vBigr}        [1]  {\Big. #1 \Big |   }
\newcommand{\nBigr}        [1]  {\Big. #1 \Big\Vert}
```

```
\newcommand{\abiggr}       [1]  {\bigg. #1 \bigg )   }
\newcommand{\bbiggr}       [1]  {\bigg. #1 \bigg ]   }
\newcommand{\cbiggr}       [1]  {\bigg. #1 \bigg\}   }
\newcommand{\vbiggr}       [1]  {\bigg. #1 \bigg |   }
\newcommand{\nbiggr}       [1]  {\bigg. #1 \bigg\Vert}
```

```
\newcommand{\aBiggr}       [1]  {\Bigg. #1 \Bigg )   }
\newcommand{\bBiggr}       [1]  {\Bigg. #1 \Bigg ]   }
\newcommand{\cBiggr}       [1]  {\Bigg. #1 \Bigg\}   }
\newcommand{\vBiggr}       [1]  {\Bigg. #1 \Bigg |   }
\newcommand{\nBiggr}       [1]  {\Bigg. #1 \Bigg\Vert}
```

Note here that I *didn't* define a `\newcommand` such like `\ambiggl` or `\vmBiggr` for enlarging of brackets with arguments having a minus sign.

Examples

$\abigl(x$	`\abigl{x}`
$\bbigl[x$	`\bbigl{x}`
$\cbigl\{x$	`\cbigl{x}`
$\vbigl\vert -x$	`\vbigl{-x}`
$\nbigl\Vert -x$	`\nbigl{-x}`

$\aBigl(x^2$	`\aBigl{x^2}`
$\bBigl[x^2$	`\bBigl{x^2}`
$\cBigl\{x^2$	`\cBigl{x^2}`
$\vBigl\vert -x^2$	`\vBigl{-x^2}`
$\nBigl\Vert -x^2$	`\nBigl{-x^2}`

$\abiggl(x^2$	`\abiggl{x^2}`
$\bbiggl[x^2$	`\bbiggl{x^2}`
$\cbiggl\{x^2$	`\cbiggl{x^2}`
$\vbiggl\vert -x^2$	`\vbiggl{-x^2}`
$\nbiggl\Vert -x^2$	`\nbiggl{-x^2}`

$\aBiggl(x^2$	`\aBiggl{x^2}`
$\bBiggl[x^2$	`\bBiggl{x^2}`
$\cBiggl\{x^2$	`\cBiggl{x^2}`
$\vBiggl\vert -x^2$	`\vBiggl{-x^2}`
$\nBiggl\Vert -x^2$	`\nBiggl{-x^2}`

$x\big)$ `\abigr{x}`

$x\big]$ `\bbigr{x}`

$x\big\}$ `\cbigr{x}`

$-\,x\big|$ `\vbigr{-x}`

$-\,x\big\|$ `\nbigr{-x}`

$x^2\Big)$ `\aBigr{x^2}`

$x^2\Big]$ `\bBigr{x^2}`

$x^2\Big\}$ `\cBigr{x^2}`

$-\,x^2\Big|$ `\vBigr{-x^2}`

$-\,x^2\Big\|$ `\nBigr{-x^2}`

$x^2\bigg)$ `\abiggr{x^2}`

$x^2\bigg]$ `\bbiggr{x^2}`

$x^2\bigg\}$ `\cbiggr{x^2}`

$-\,x^2\bigg|$ `\vbiggr{-x^2}`

$-\,x^2\bigg\|$ `\nbiggr{-x^2}`

$x^2\Bigg)$ `\aBiggr{x^2}`

$x^2\Bigg]$ `\bBiggr{x^2}`

$x^2\Bigg\}$ `\cBiggr{x^2}`

$-\,x^2\Bigg|$ `\vBiggr{-x^2}`

$-\,x^2\Bigg\|$ `\nBiggr{-x^2}`

2.4 Accents

First, I had to use the *triple dot* of x in classical mechanics. Hence, I defined this `\newcommand`:

Definition

```
\newcommand{\tdot}              {\stackrel{\cdots}}
```

where the "t" stands for "triple".

Example

$\overset{\cdots}{a}$	`\tdot{a}`

On the other hand, when we use the original LaTeX commands for accents in the math mode such like: `$\bar{H}$`, `$\tilde{O}$`, and `$\hat{T}$`, we will get $\bar{H}$, $\tilde{O}$, and $\hat{T}$. I personally don't like them. First, they have been always printed in the *italic* type; Second, the accents above the letters are not wide enough. The best solution of these two problems is to define more `\newcommand`s for different types and sizes of accents. For the `\bar` family I have

Definitions

```
\newcommand{\Bar}               {\overline}
```

```
\newcommand{\brm}          [1]  {\bar     {\rm #1}}

\newcommand{\Brm}          [1]  {\overline{\rm #1}}
```

```
\newcommand{\bbf}          [1]  {\bar     {\bf #1}}

\newcommand{\Bbf}          [1]  {\overline{\bf #1}}
```

Here "rm" and "bf" stand for "roman" and "bold face" types (came directly form the LaTeX commands for these two types `\rm` and `\bf`), and I used, as usual, the capital letter "B" for "wide bar". Moreover, the "tilde" and "wide tilde" family have been defined as

Definitions

```
\newcommand{\td}                {\tilde}

\newcommand{\Td}                {\widetilde}
```

```
\newcommand{\trm}          [1]  {\tilde    {\rm #1}}

\newcommand{\Trm}          [1]  {\widetilde{\rm #1}}
```

```
\newcommand{\tbf}          [1]  {\tilde    {\bf #1}}

\newcommand{\Tbf}          [1]  {\widetilde{\bf #1}}
```

where the capital "T" stands for "wide tilde". The `\newcommand`s for "hat" and "wide hat" are

Definitions

```
\newcommand{\h}                 {\widehat}
```

```
\newcommand{\hrm}          [1]  {\hat    {\rm #1}}
\newcommand{\Hrm}          [1]  {\widehat{\rm #1}}
```

```
\newcommand{\hbf}          [1]  {\hat    {\bf #1}}
\newcommand{\Hbf}          [1]  {\widehat{\bf #1}}
```

Note that the `\newcommand` for "wide hat" has been defined as `\h`, with the *small* letter "h", because the command `\H` has already defined as original LaTeX command for ő (`\H{a}`).

Examples

$\overline{U}$	`\Bar{U}`
$\bar{\mathrm{J}}$	`\brm{J}`
$\overline{\mathrm{U}}$	`\Brm{U}`
$\bar{\mathbf{J}}$	`\bbf{J}`
$\overline{\mathbf{U}}$	`\Bbf{U}`

$\tilde{J}$	`\td{J}`
$\widetilde{U}$	`\Td{U}`
$\tilde{\mathrm{J}}$	`\trm{J}`
$\widetilde{\mathrm{U}}$	`\Trm{U}`
$\tilde{\mathbf{J}}$	`\tbf{J}`
$\widetilde{\mathbf{U}}$	`\Tbf{U}`

$\widehat{a}$	`\h{a}`
$\hat{\mathrm{I}}$	`\hrm{I}`
$\widehat{\mathrm{U}}$	`\Hrm{U}`
$\hat{\mathbf{I}}$	`\hbf{I}`
$\widehat{\mathbf{U}}$	`\Hbf{U}`

2.5 Greek letters in the bold face print type

Sometimes I have to use the greek letters as vectors or axes in physics. But the (series of) command for a greek letter in bold face type is too long to type and too complicate to remember. So, just define a simple `\newcommand` for always.

Definition

```
\newcommand{\bfG}          [1]  {\mbox{\boldmath$#1$}}
```

Furthermore, I defined some `\newcommand`s for the cases with accents as following:

Definitions

```
\newcommand{\bbfG}         [1]  {\bar      {\mbox{\boldmath$#1$}}}
\newcommand{\BbfG}         [1]  {\overline {\mbox{\boldmath$#1$}}}
```

```
\newcommand{\tbfG}         [1]  {\tilde    {\mbox{\boldmath$#1$}}}
\newcommand{\TbfG}         [1]  {\widetilde{\mbox{\boldmath$#1$}}}
```

```
\newcommand{\hbfG}         [1]  {\hat      {\mbox{\boldmath$#1$}}}
\newcommand{\HbfG}         [1]  {\widehat  {\mbox{\boldmath$#1$}}}
```

Examples

ω	`\bfG{\omega}`

$\bar{\xi}$	`\bbfG{\xi}`
$\overline{\Omega}$	`\BbfG{\Omega}`

$\tilde{\xi}$	`\tbfG{\xi}`
$\widetilde{\Omega}$	`\TbfG{\Omega}`

$\hat{\xi}$	`\hbfG{\xi}`
$\widehat{\Omega}$	`\HbfG{\Omega}`

On the other hand, it is convenient for physicists to have some commands for the axes of the coordinate systems specially. For the *Cartisian coordinates*, I have

Definitions

```
\newcommand{\Axis}         [1]  {\hspace{0.375ex} \widehat{\bf e}_{#1}}
\newcommand{\axis}         [1]  {\hspace{0.375ex} \widehat{\bf #1}}
```

and for the spherical and cylindrical coordinates,

Definition

```
\newcommand{\axisG}       [1]  {\hspace{0.375ex} \widehat{\mbox{\boldmath$#1$}}}
```

Examples

$\widehat{\mathbf{e}}_x$	`\Axis{x}`
$\widehat{\mathbf{x}}$	`\axis{x}`

$\widehat{\boldsymbol{\theta}}$	`\axisG{\theta}`

2.6 Ordinary differentiations

2.6.1 Pure ordinary differentiations or ordinary differentiations in brackets

For a ordinary differentiation such like

$$\frac{d^2 f}{dxdy}$$

we need a long command: `\frac{d^2 f}{dx dy}`. It is surely very convenient to define some `\newcommand`s as

Definitions

```
\newcommand{\dd}          [1]  {\frac{d     }{d #1       }}
\newcommand{\ddd}         [1]  {\frac{d^2   }{d #1^2     }}
\newcommand{\dddd}        [2]  {\frac{d^2   }{d #1   d #2}}
\newcommand{\ddn}         [2]  {\frac{d^{#2}}{d #1^{#2}  }}
```

```
\newcommand{\Dd}          [2]  {\frac{d      #1}{d #2       }}
\newcommand{\DDd}         [2]  {\frac{d^2    #1}{d #2^2     }}
\newcommand{\DDdd}        [3]  {\frac{d^2    #1}{d #2   d #3}}
\newcommand{\Ddn}         [3]  {\frac{d^{#3} #1}{d #2^{#3}  }}
```

These commands look complicate. But, they are actually very convenient to remember and use. First, we need to know how many "d"s there are in this expression ($d^2 = dd$ counts as 2). If there is also the differentiated function, e.g., f, here, then we write down a capital "D"; otherwise, we just write down a small "d". Second, we write down what we want to differentiate and with respect to what we differentiate. Note here that, first, for x^2 you just need to give an x as argument this time; second, if there is no differentiated function, you don't need to (can not!) write { } for the lack differentiate function (This is why the number of arguments in the first box above are always one argument less than those in the second box). Now I give the examples to let you understand better and clearer:

Examples

$\frac{d}{dx}$	`\dd{x}`
$\frac{d^2}{dx^2}$	`\ddd{x}`
$\frac{d^2}{dxdy}$	`\dddd{x}{y}`
$\frac{d^k}{dx^k}$	`\ddn{x}{k}`

$\frac{df}{dx}$	`\Dd{f}{x}`
$\frac{d^2f}{dx^2}$	`\DDd{f}{x}`
$\frac{d^2f}{dxdy}$	`\DDdd{f}{x}{y}`
$\frac{d^kf}{dx^k}$	`\Ddn{f}{x}{k}`

Moreover, for the expression in brackets such like

$$\left(\frac{d}{dx}\right)$$

or

$$\left[\frac{df(x)}{dx}\right]$$

you just have to add an "a" or "b" in front of, for example, `dd` or `DDd`.

Definitions

```
\newcommand{\add}          [1]  {\left(\frac{d     }{d #1       }\right)}
\newcommand{\addd}         [1]  {\left(\frac{d^2   }{d #1^2     }\right)}
\newcommand{\adddd}        [2]  {\left(\frac{d^2   }{d #1   d #2}\right)}
\newcommand{\addn}         [2]  {\left(\frac{d^{#2}}{d #1^{#2}  }\right)}
```

```
\newcommand{\bdd}          [1]  {\left[\frac{d     }{d #1       }\right]}
\newcommand{\bddd}         [1]  {\left[\frac{d^2   }{d #1^2     }\right]}
\newcommand{\bdddd}        [2]  {\left[\frac{d^2   }{d #1   d #2}\right]}
\newcommand{\bddn}         [2]  {\left[\frac{d^{#2}}{d #1^{#2}  }\right]}
```

```
\newcommand{\aDd}          [2]  {\left(\frac{d      #1}{d #2       }\right)}
\newcommand{\aDDd}         [2]  {\left(\frac{d^2    #1}{d #2^2     }\right)}
\newcommand{\aDDdd}        [3]  {\left(\frac{d^2    #1}{d #2   d #3}\right)}
\newcommand{\aDdn}         [3]  {\left(\frac{d^{#3} #1}{d #2^{#3}  }\right)}
```

```
\newcommand{\bDd}          [2]  {\left[\frac{d      #1}{d #2       }\right]}
\newcommand{\bDDd}         [2]  {\left[\frac{d^2    #1}{d #2^2     }\right]}
\newcommand{\bDDdd}        [3]  {\left[\frac{d^2    #1}{d #2   d #3}\right]}
\newcommand{\bDdn}         [3]  {\left[\frac{d^{#3} #1}{d #2^{#3}  }\right]}
```

Examples

$\left(\frac{d}{dx}\right)$ `\add{x}`

$\left(\frac{d^2}{dx^2}\right)$ `\addd{x}`

$\left(\frac{d^2}{dxdy}\right)$ `\adddd{x}{y}`

$\left(\frac{d^k}{dx^k}\right)$ `\addn{x}{k}`

$\left[\frac{d}{dx}\right]$ `\bdd{x}`

$\left[\frac{d^2}{dx^2}\right]$ `\bddd{x}`

$\left[\frac{d^2}{dxdy}\right]$ `\bdddd{x}{y}`

$\left[\frac{d^k}{dx^k}\right]$ `\bddn{x}{k}`

$\left(\frac{df}{dx}\right)$ `\aDd{f}{x}`

$\left(\frac{d^2f}{dx^2}\right)$ `\aDDd{f}{x}`

$\left(\frac{d^2f}{dxdy}\right)$ `\aDDdd{f}{x}{y}`

$\left(\frac{d^kf}{dx^k}\right)$ `\aDdn{f}{x}{k}`

$\left[\frac{df(x)}{dx}\right]$ `\bDd{f(x)}{x}`

$\left[\frac{d^2f(x)}{dx^2}\right]$ `\bDDd{f(x)}{x}`

$\left[\frac{d^2f(x,y)}{dxdy}\right]$ `\bDDdd{f(x,y)}{x}{y}`

$\left[\frac{d^kf(x,y)}{dx^k}\right]$ `\bDdn{f(x,y)}{x}{k}`

2.6.2 Completing the "a-b-c-v-n-s" system for the ordinary differentiations

In order to complete my "a-b-c-v-n-s" system for the ordinary differentiations in brackets and so on, I added the following `\newcommand`s for the differentiations having d/dx form,

Definitions

```
\newcommand{\cdd}         [1]  {\left\{   \frac{d     }{d #1       }\right\}   }
\newcommand{\cddd}        [1]  {\left\{   \frac{d^2   }{d #1^2     }\right\}   }
\newcommand{\cddddd}      [2]  {\left\{   \frac{d^2   }{d #1   d #2}\right\}   }
\newcommand{\cddn}        [2]  {\left\{   \frac{d^{#2}}{d #1^{#2}  }\right\}   }
```

```
\newcommand{\vdd}         [1]  {\left |   \frac{d     }{d #1       }\right |   }
\newcommand{\vddd}        [1]  {\left |   \frac{d^2   }{d #1^2     }\right |   }
\newcommand{\vddddd}      [2]  {\left |   \frac{d^2   }{d #1   d #2}\right |   }
\newcommand{\vddn}        [2]  {\left |   \frac{d^{#2}}{d #1^{#2}  }\right |   }
```

```
\newcommand{\ndd}         [1]  {\left\Vert\frac{d     }{d #1       }\right\Vert}
\newcommand{\nddd}        [1]  {\left\Vert\frac{d^2   }{d #1^2     }\right\Vert}
\newcommand{\nddddd}      [2]  {\left\Vert\frac{d^2   }{d #1   d #2}\right\Vert}
\newcommand{\nddn}        [2]  {\left\Vert\frac{d^{#2}}{d #1^{#2}  }\right\Vert}
```

```
\newcommand{\sdd}         [1]  {\sqrt {   \frac{d     }{d #1       }\right }   }
\newcommand{\sddd}        [1]  {\sqrt {   \frac{d^2   }{d #1^2     }\right }   }
\newcommand{\sddddd}      [2]  {\sqrt {   \frac{d^2   }{d #1   d #2}\right }   }
\newcommand{\sddn}        [2]  {\sqrt {   \frac{d^{#2}}{d #1^{#2}  }\right }   }
```

Examples

$\left\{\frac{d}{dx}\right\}$	`\cdd{x}`
$\left\{\frac{d^2}{dx^2}\right\}$	`\cddd{x}`
$\left\{\frac{d^2}{dxdy}\right\}$	`\cdddd{x}{y}`
$\left\{\frac{d^k}{dx^k}\right\}$	`\cddn{x}{k}`

$\left\lvert\frac{d}{dx}\right\rvert$	`\vdd{x}`
$\left\lvert\frac{d^2}{dx^2}\right\rvert$	`\vddd{x}`
$\left\lvert\frac{d^2}{dxdy}\right\rvert$	`\vdddd{x}{y}`
$\left\lvert\frac{d^k}{dx^k}\right\rvert$	`\vddn{x}{k}`

$\left\lVert\frac{d}{dx}\right\rVert$	`\ndd{x}`
$\left\lVert\frac{d^2}{dx^2}\right\rVert$	`\nddd{x}`
$\left\lVert\frac{d^2}{dxdy}\right\rVert$	`\ndddd{x}{y}`
$\left\lVert\frac{d^k}{dx^k}\right\rVert$	`\nddn{x}{k}`

$\sqrt{\frac{d}{dx}}$	`\sdd{x}`
$\sqrt{\frac{d^2}{dx^2}}$	`\sddd{x}`
$\sqrt{\frac{d^2}{dxdy}}$	`\sdddd{x}{y}`
$\sqrt{\frac{d^k}{dx^k}}$	`\sddn{x}{k}`

And, for the differentiations having df/dx form, I have

Definitions

```
\newcommand{\cDd}       [2]  {\left\{   \frac{d      #1}{d #2       }\right\}   }
\newcommand{\cDDd}      [2]  {\left\{   \frac{d^2    #1}{d #2^2     }\right\}   }
\newcommand{\cDDdd}     [3]  {\left\{   \frac{d^2    #1}{d #2   d #3}\right\}   }
\newcommand{\cDdn}      [3]  {\left\{   \frac{d^{#3} #1}{d #2^{#3}  }\right\}   }
```

```
\newcommand{\vDd}       [2]  {\left |   \frac{d      #1}{d #2       }\right |   }
\newcommand{\vDDd}      [2]  {\left |   \frac{d^2    #1}{d #2^2     }\right |   }
\newcommand{\vDDdd}     [3]  {\left |   \frac{d^2    #1}{d #2   d #3}\right |   }
\newcommand{\vDdn}      [3]  {\left |   \frac{d^{#3} #1}{d #2^{#3}  }\right |   }
```

```
\newcommand{\nDd}       [2]  {\left\Vert\frac{d      #1}{d #2       }\right\Vert}
\newcommand{\nDDd}      [2]  {\left\Vert\frac{d^2    #1}{d #2^2     }\right\Vert}
\newcommand{\nDDdd}     [3]  {\left\Vert\frac{d^2    #1}{d #2   d #3}\right\Vert}
\newcommand{\nDdn}      [3]  {\left\Vert\frac{d^{#3} #1}{d #2^{#3}  }\right\Vert}
```

```
\newcommand{\sDd}       [2]  {\sqrt {   \frac{d      #1}{d #2       }       }   }
\newcommand{\sDDd}      [2]  {\sqrt {   \frac{d^2    #1}{d #2^2     }       }   }
\newcommand{\sDDdd}     [3]  {\sqrt {   \frac{d^2    #1}{d #2   d #3}       }   }
\newcommand{\sDdn}      [3]  {\sqrt {   \frac{d^{#3} #1}{d #2^{#3}  }       }   }
```

Examples

$\left\{\frac{df(x)}{dx}\right\}$	`\cDd{f(x)}{x}`
$\left\{\frac{d^2f(x)}{dx^2}\right\}$	`\cDDd{f(x)}{x}`
$\left\{\frac{d^2f(x,y)}{dxdy}\right\}$	`\cDDdd{f(x,y)}{x}{y}`
$\left\{\frac{d^kf(x,y)}{dx^k}\right\}$	`\cDdn{f(x,y)}{x}{k}`

$\left\vert \frac{df}{dx} \right\vert$	`\vDd{f}{x}`
$\left\vert \frac{d^2 f}{dx^2} \right\vert$	`\vDDd{f}{x}`
$\left\vert \frac{d^2 f}{dxdy} \right\vert$	`\vDDdd{f}{x}{y}`
$\left\vert \frac{d^k f}{dx^k} \right\vert$	`\vDdn{f}{x}{k}`

$\left\Vert \frac{df}{dx} \right\Vert$	`\nDd{f}{x}`
$\left\Vert \frac{d^2 f}{dx^2} \right\Vert$	`\nDDd{f}{x}`
$\left\Vert \frac{d^2 f}{dxdy} \right\Vert$	`\nDDdd{f}{x}{y}`
$\left\Vert \frac{d^k f}{dx^k} \right\Vert$	`\nDdn{f}{x}{k}`

$\sqrt{\frac{df}{dx}}$	`\sDd{f}{x}`
$\sqrt{\frac{d^2 f}{dx^2}}$	`\sDDd{f}{x}`
$\sqrt{\frac{d^2 f}{dxdy}}$	`\sDDdd{f}{x}{y}`
$\sqrt{\frac{d^k f}{dx^k}}$	`\sDdn{f}{x}{k}`

2.6.3 "A-B-C-V-N" system for the ordinary differentiations

Similar to the definitions like `\Afrac`, you can use the following `\newcommand`s to enlarge the brackets or square roots. For the d/dx-like differentiations, corresponding to `\add`, `\vdddd` and so on, I have

Definitions

```
\newcommand{\Add}          [1]  {\Bigg (   \frac{d     }{d #1       }\Bigg )   }
\newcommand{\Addd}         [1]  {\Bigg (   \frac{d^2   }{d #1^2     }\Bigg )   }
\newcommand{\Adddd}        [2]  {\Bigg (   \frac{d^2   }{d #1   d #2}\Bigg )   }
\newcommand{\Addn}         [2]  {\Bigg (   \frac{d^{#2}}{d #1^{#2}  }\Bigg )   }
```

```
\newcommand{\Bdd}          [1]  {\Bigg [   \frac{d     }{d #1       }\Bigg ]   }
\newcommand{\Bddd}         [1]  {\Bigg [   \frac{d^2   }{d #1^2     }\Bigg ]   }
\newcommand{\Bdddd}        [2]  {\Bigg [   \frac{d^2   }{d #1   d #2}\Bigg ]   }
\newcommand{\Bddn}         [2]  {\Bigg [   \frac{d^{#2}}{d #1^{#2}  }\Bigg ]   }
```

```
\newcommand{\Cdd}          [1]  {\Bigg\{   \frac{d     }{d #1       }\Bigg\}   }
\newcommand{\Cddd}         [1]  {\Bigg\{   \frac{d^2   }{d #1^2     }\Bigg\}   }
\newcommand{\Cdddd}        [2]  {\Bigg\{   \frac{d^2   }{d #1   d #2}\Bigg\}   }
\newcommand{\Cddn}         [2]  {\Bigg\{   \frac{d^{#2}}{d #1^{#2}  }\Bigg\}   }
```

```
\newcommand{\Vdd}          [1]  {\Bigg |   \frac{d     }{d #1       }\Bigg |   }
\newcommand{\Vddd}         [1]  {\Bigg |   \frac{d^2   }{d #1^2     }\Bigg |   }
\newcommand{\Vdddd}        [2]  {\Bigg |   \frac{d^2   }{d #1   d #2}\Bigg |   }
\newcommand{\Vddn}         [2]  {\Bigg |   \frac{d^{#2}}{d #1^{#2}  }\Bigg |   }
```

```
\newcommand{\Ndd}          [1]  {\Bigg\Vert\frac{d     }{d #1       }\Bigg\Vert}
\newcommand{\Nddd}         [1]  {\Bigg\Vert\frac{d^2   }{d #1^2     }\Bigg\Vert}
\newcommand{\Ndddd}        [2]  {\Bigg\Vert\frac{d^2   }{d #1   d #2}\Bigg\Vert}
\newcommand{\Nddn}         [2]  {\Bigg\Vert\frac{d^{#2}}{d #1^{#2}  }\Bigg\Vert}
```

Examples

$\left(\frac{d}{dx}\right)$	`\Add{x}`
$\left(\frac{d^2}{dx^2}\right)$	`\Addd{x}`
$\left(\frac{d^2}{dxdy}\right)$	`\Adddd{x}{y}`
$\left(\frac{d^k}{dx^k}\right)$	`\Addn{x}{k}`

$\left[\frac{d}{dx}\right]$ `\Bdd{x}`

$\left[\frac{d^2}{dx^2}\right]$ `\Bddd{x}`

$\left[\frac{d^2}{dxdy}\right]$ `\Bdddd{x}{y}`

$\left[\frac{d^k}{dx^k}\right]$ `\Bddn{x}{k}`

$\left\{\frac{d}{dx}\right\}$ `\Cdd{x}`

$\left\{\frac{d^2}{dx^2}\right\}$ `\Cddd{x}`

$\left\{\frac{d^2}{dxdy}\right\}$ `\Cdddd{x}{y}`

$\left\{\frac{d^k}{dx^k}\right\}$ `\Cddn{x}{k}`

$\left|\frac{d}{dx}\right|$ `\Vdd{x}`

$\left|\frac{d^2}{dx^2}\right|$ `\Vddd{x}`

$\left|\frac{d^2}{dxdy}\right|$ `\Vdddd{x}{y}`

$\left|\frac{d^k}{dx^k}\right|$ `\Vddn{x}{k}`

$\left\|\frac{d}{dx}\right\|$ `\Ndd{x}`

$\left\|\frac{d^2}{dx^2}\right\|$ `\Nddd{x}`

$\left\|\frac{d^2}{dxdy}\right\|$ `\Ndddd{x}{y}`

$\left\|\frac{d^k}{dx^k}\right\|$ `\Nddn{x}{k}`

and, for the df/dx-like differentiations, corresponding to `\aDd`, `\vDDdd` and so on, I have

Definitions

```
\newcommand{\ADd}          [2]  {\Bigg (   \frac{d      #1}{d #2       }\Bigg )   }
\newcommand{\ADDd}         [2]  {\Bigg (   \frac{d^2    #1}{d #2^2     }\Bigg )   }
\newcommand{\ADDdd}        [3]  {\Bigg (   \frac{d^2    #1}{d #2   d #3}\Bigg )   }
\newcommand{\ADdn}         [3]  {\Bigg (   \frac{d^{#3} #1}{d #2^{#3}  }\Bigg )   }
```

```
\newcommand{\BDd}          [2]  {\Bigg [   \frac{d      #1}{d #2       }\Bigg ]   }
\newcommand{\BDDd}         [2]  {\Bigg [   \frac{d^2    #1}{d #2^2     }\Bigg ]   }
\newcommand{\BDDdd}        [3]  {\Bigg [   \frac{d^2    #1}{d #2   d #3}\Bigg ]   }
\newcommand{\BDdn}         [3]  {\Bigg [   \frac{d^{#3} #1}{d #2^{#3}  }\Bigg ]   }
```

```
\newcommand{\CDd}          [2]  {\Bigg\{   \frac{d      #1}{d #2       }\Bigg\}   }
\newcommand{\CDDd}         [2]  {\Bigg\{   \frac{d^2    #1}{d #2^2     }\Bigg\}   }
\newcommand{\CDDdd}        [3]  {\Bigg\{   \frac{d^2    #1}{d #2   d #3}\Bigg\}   }
\newcommand{\CDdn}         [3]  {\Bigg\{   \frac{d^{#3} #1}{d #2^{#3}  }\Bigg\}   }
```

```
\newcommand{\VDd}          [2]  {\Bigg |   \frac{d      #1}{d #2       }\Bigg |   }
\newcommand{\VDDd}         [2]  {\Bigg |   \frac{d^2    #1}{d #2^2     }\Bigg |   }
\newcommand{\VDDdd}        [3]  {\Bigg |   \frac{d^2    #1}{d #2   d #3}\Bigg |   }
\newcommand{\VDdn}         [3]  {\Bigg |   \frac{d^{#3} #1}{d #2^{#3}  }\Bigg |   }
```

```
\newcommand{\NDd}          [2]  {\Bigg\Vert\frac{d      #1}{d #2       }\Bigg\Vert}
\newcommand{\NDDd}         [2]  {\Bigg\Vert\frac{d^2    #1}{d #2^2     }\Bigg\Vert}
\newcommand{\NDDdd}        [3]  {\Bigg\Vert\frac{d^2    #1}{d #2   d #3}\Bigg\Vert}
\newcommand{\NDdn}         [3]  {\Bigg\Vert\frac{d^{#3} #1}{d #2^{#3}  }\Bigg\Vert}
```

Examples

$\left(\frac{df}{dx}\right)$ `\ADd{f}{x}`

$\left(\frac{d^2f}{dx^2}\right)$ `\ADDd{f}{x}`

$\left(\frac{d^2f}{dxdy}\right)$ `\ADDdd{f}{x}{y}`

$\left(\frac{d^kf}{dx^k}\right)$ `\ADdn{f}{x}{k}`

$\left[\frac{df(x)}{dx}\right]$ `\BDd{f(x)}{x}`

$\left[\frac{d^2f(x)}{dx^2}\right]$ `\BDDd{f(x)}{x}`

$\left[\frac{d^2f(x,y)}{dxdy}\right]$ `\BDDdd{f(x,y)}{x}{y}`

$\left[\frac{d^kf(x,y)}{dx^k}\right]$ `\BDdn{f(x,y)}{x}{k}`

$\left\{\frac{df(x)}{dx}\right\}$ `\CDd{f(x)}{x}`

$\left\{\frac{d^2f(x)}{dx^2}\right\}$ `\CDDd{f(x)}{x}`

$\left\{\frac{d^2f(x,y)}{dxdy}\right\}$ `\CDDdd{f(x,y)}{x}{y}`

$\left\{\frac{d^kf(x,y)}{dx^k}\right\}$ `\CDdn{f(x,y)}{x}{k}`

$\left|\frac{df}{dx}\right|$ `\VDd{f}{x}`

$\left|\frac{d^2f}{dx^2}\right|$ `\VDDd{f}{x}`

$\left|\frac{d^2f}{dxdy}\right|$ `\VDDdd{f}{x}{y}`

$\left|\frac{d^kf}{dx^k}\right|$ `\VDdn{f}{x}{k}`

$\left\|\frac{df}{dx}\right\|$	`\NDd{f}{x}`
$\left\|\frac{d^2f}{dx^2}\right\|$	`\NDDd{f}{x}`
$\left\|\frac{d^2f}{dxdy}\right\|$	`\NDDdd{f}{x}{y}`
$\left\|\frac{d^kf}{dx^k}\right\|$	`\NDdn{f}{x}{k}`

Note that there is no such `\newcommand` like `\Sdd` or `\SDDdd`.

2.7 Partial differentiations

First, I defined an abbreviation for the original LaTeX command `\partial` as

Definition

```
\newcommand{\p}                 {\partial}
```

2.7.1 Pure partial differentiations

As for the ordinary differentiations, I defined the following `\newcommand`s:

Definitions

```
\newcommand{\pp}          [1]  {\frac{\partial     }{\partial #1              }}
\newcommand{\ppp}         [1]  {\frac{\partial^2   }{\partial #1^2            }}
\newcommand{\pppp}        [2]  {\frac{\partial^2   }{\partial #1   \partial #2}}
\newcommand{\ppn}         [2]  {\frac{\partial^{#2}}{\partial #1^{#2}         }}
```

```
\newcommand{\Pp}          [2]  {\frac{\partial      #1}{\partial #2              }}
\newcommand{\PPp}         [2]  {\frac{\partial^2    #1}{\partial #2^2            }}
\newcommand{\PPpp}        [3]  {\frac{\partial^2    #1}{\partial #2   \partial #3}}
\newcommand{\Ppn}         [3]  {\frac{\partial^{#3} #1}{\partial #2^{#3}         }}
```

Here you just have to replace "d" or "D" in the `\newcommand`s for ordinary differentiations by "p" or "P" to get the `\newcommand`s for partial differentiations.

Examples

$\dfrac{\partial}{\partial x}$	`\pp{x}`
$\dfrac{\partial^2}{\partial x^2}$	`\ppp{x}`
$\dfrac{\partial^2}{\partial x \partial y}$	`\pppp{x}{y}`
$\dfrac{\partial^k}{\partial x^k}$	`\ppn{x}{k}`

$\dfrac{\partial f}{\partial x}$	`\Pp{f}{x}`
$\dfrac{\partial^2 f}{\partial x^2}$	`\PPp{f}{x}`
$\dfrac{\partial^2 f}{\partial x \partial y}$	`\PPpp{f}{x}{y}`
$\dfrac{\partial^k f}{\partial x^k}$	`\Ppn{f}{x}{k}`

2.7.2 Partial differentiations in brackets

Also, for the $\partial/\partial x$-like partial differentiations in brackets and so on, I have

Definitions

```
\newcommand{\app}      [1]  {\left (\frac{\partial    }{\partial #1            }\right )}
\newcommand{\appp}     [1]  {\left (\frac{\partial^2  }{\partial #1^2          }\right )}
\newcommand{\apppp}    [2]  {\left (\frac{\partial^2  }{\partial #1  \partial #2}\right )}
\newcommand{\appn}     [2]  {\left (\frac{\partial^{#2}}{\partial #1^{#2}       }\right )}
```

```
\newcommand{\bpp}      [1]  {\left [\frac{\partial    }{\partial #1            }\right ]}
\newcommand{\bppp}     [1]  {\left [\frac{\partial^2  }{\partial #1^2          }\right ]}
\newcommand{\bpppp}    [2]  {\left [\frac{\partial^2  }{\partial #1  \partial #2}\right ]}
\newcommand{\bppn}     [2]  {\left [\frac{\partial^{#2}}{\partial #1^{#2}       }\right ]}
```

```
\newcommand{\cpp}      [1]  {\left\{\frac{\partial    }{\partial #1            }\right\}}
\newcommand{\cppp}     [1]  {\left\{\frac{\partial^2  }{\partial #1^2          }\right\}}
\newcommand{\cpppp}    [2]  {\left\{\frac{\partial^2  }{\partial #1  \partial #2}\right\}}
\newcommand{\cppn}     [2]  {\left\{\frac{\partial^{#2}}{\partial #1^{#2}       }\right\}}
```

```
\newcommand{\vpp}       [1]  {\left |\frac{\partial    }{\partial #1             }\right |}
\newcommand{\vppp}      [1]  {\left |\frac{\partial^2  }{\partial #1^2           }\right |}
\newcommand{\vpppp}     [2]  {\left |\frac{\partial^2  }{\partial #1  \partial #2}\right |}
\newcommand{\vppn}      [2]  {\left |\frac{\partial^{#2}}{\partial #1^{#2}       }\right |}
```

```
\newcommand{\npp}       [1]  {\left\Vert\frac{\partial    }{\partial #1             }\right\Vert}
\newcommand{\nppp}      [1]  {\left\Vert\frac{\partial^2  }{\partial #1^2           }\right\Vert}
\newcommand{\npppp}     [2]  {\left\Vert\frac{\partial^2  }{\partial #1  \partial #2}\right\Vert}
\newcommand{\nppn}      [2]  {\left\Vert\frac{\partial^{#2}}{\partial #1^{#2}       }\right\Vert}
```

```
\newcommand{\spp}       [1]  {\sqrt {\frac{\partial    }{\partial #1             }      }}
\newcommand{\sppp}      [1]  {\sqrt {\frac{\partial^2  }{\partial #1^2           }      }}
\newcommand{\spppp}     [2]  {\sqrt {\frac{\partial^2  }{\partial #1  \partial #2}      }}
\newcommand{\sppn}      [2]  {\sqrt {\frac{\partial^{#2}}{\partial #1^{#2}       }      }}
```

Examples

$\left(\frac{\partial}{\partial x}\right)$ `\app{x}`

$\left(\frac{\partial^2}{\partial x^2}\right)$ `\appp{x}`

$\left(\frac{\partial^2}{\partial x \partial y}\right)$ `\apppp{x}{y}`

$\left(\frac{\partial^k}{\partial x^k}\right)$ `\appn{x}{k}`

$\left[\frac{\partial}{\partial x}\right]$ `\bpp{x}`

$\left[\frac{\partial^2}{\partial x^2}\right]$ `\bppp{x}`

$\left[\frac{\partial^2}{\partial x \partial y}\right]$ `\bpppp{x}{y}`

$\left[\frac{\partial^k}{\partial x^k}\right]$ `\bppn{x}{k}`

$\left\{ \dfrac{\partial}{\partial x} \right\}$	`\cpp{x}`
$\left\{ \dfrac{\partial^2}{\partial x^2} \right\}$	`\cppp{x}`
$\left\{ \dfrac{\partial^2}{\partial x \partial y} \right\}$	`\cpppp{x}{y}`
$\left\{ \dfrac{\partial^k}{\partial x^k} \right\}$	`\cppn{x}{k}`

$\left\| \dfrac{\partial}{\partial x} \right\|$	`\vpp{x}`
$\left\| \dfrac{\partial^2}{\partial x^2} \right\|$	`\vppp{x}`
$\left\| \dfrac{\partial^2}{\partial x \partial y} \right\|$	`\vpppp{x}{y}`
$\left\| \dfrac{\partial^k}{\partial x^k} \right\|$	`\vppn{x}{k}`

$\left\| \dfrac{\partial}{\partial x} \right\|$	`\npp{x}`
$\left\| \dfrac{\partial^2}{\partial x^2} \right\|$	`\nppp{x}`
$\left\| \dfrac{\partial^2}{\partial x \partial y} \right\|$	`\npppp{x}{y}`
$\left\| \dfrac{\partial^k}{\partial x^k} \right\|$	`\nppn{x}{k}`

$\sqrt{\dfrac{\partial}{\partial x}}$	`\spp{x}`
$\sqrt{\dfrac{\partial^2}{\partial x^2}}$	`\sppp{x}`
$\sqrt{\dfrac{\partial^2}{\partial x \partial y}}$	`\spppp{x}{y}`
$\sqrt{\dfrac{\partial^k}{\partial x^k}}$	`\sppn{x}{k}`

For the $\partial f/\partial x$-like partial differentiations in brackets, I have

Definitions

```
\newcommand{\aPp}          [2]  {\left (   \frac{\partial      #1}{\partial #2             }\right )   }
\newcommand{\aPPp}         [2]  {\left (   \frac{\partial^2    #1}{\partial #2^2           }\right )   }
\newcommand{\aPPpp}        [3]  {\left (   \frac{\partial^2    #1}{\partial #2   \partial #3}\right )   }
\newcommand{\aPpn}         [3]  {\left (   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\right )   }
```

```
\newcommand{\bPp}          [2]  {\left [   \frac{\partial      #1}{\partial #2             }\right ]   }
\newcommand{\bPPp}         [2]  {\left [   \frac{\partial^2    #1}{\partial #2 ^2          }\right ]   }
\newcommand{\bPPpp}        [3]  {\left [   \frac{\partial^2    #1}{\partial #2   \partial #3}\right ]   }
\newcommand{\bPpn}         [3]  {\left [   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\right ]   }
```

```
\newcommand{\cPp}          [2]  {\left\{   \frac{\partial      #1}{\partial #2             }\right\}   }
\newcommand{\cPPp}         [2]  {\left\{   \frac{\partial^2    #1}{\partial #2 ^2          }\right\}   }
\newcommand{\cPPpp}        [3]  {\left\{   \frac{\partial^2    #1}{\partial #2   \partial #3}\right\}   }
\newcommand{\cPpn}         [3]  {\left\{   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\right\}   }
```

```
\newcommand{\vPp}          [2]  {\left |   \frac{\partial      #1}{\partial #2             }\right |   }
\newcommand{\vPPp}         [2]  {\left |   \frac{\partial^2    #1}{\partial #2 ^2          }\right |   }
\newcommand{\vPPpp}        [3]  {\left |   \frac{\partial^2    #1}{\partial #2   \partial #3}\right |   }
\newcommand{\vPpn}         [3]  {\left |   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\right |   }
```

```
\newcommand{\nPp}          [2]  {\left\Vert\frac{\partial      #1}{\partial #2             }\right\Vert}
\newcommand{\nPPp}         [2]  {\left\Vert\frac{\partial^2    #1}{\partial #2 ^2          }\right\Vert}
\newcommand{\nPPpp}        [3]  {\left\Vert\frac{\partial^2    #1}{\partial #2   \partial #3}\right\Vert}
\newcommand{\nPpn}         [3]  {\left\Vert\frac{\partial^{#3} #1}{\partial #2^{#3}         }\right\Vert}
```

```
\newcommand{\sPp}          [2]  {\sqrt {   \frac{\partial      #1}{\partial #2             }       }   }
\newcommand{\sPPp}         [2]  {\sqrt {   \frac{\partial^2    #1}{\partial #2 ^2          }       }   }
\newcommand{\sPPpp}        [3]  {\sqrt {   \frac{\partial^2    #1}{\partial #2   \partial #3}       }   }
\newcommand{\sPpn}         [3]  {\sqrt {   \frac{\partial^{#3} #1}{\partial #2^{#3}         }       }   }
```

Examples

$\left(\frac{\partial f}{\partial x}\right)$ `\aPp{f}{x}`

$\left(\frac{\partial^2 f}{\partial x^2}\right)$ `\aPPp{f}{x}`

$\left(\frac{\partial^2 f}{\partial x \partial y}\right)$ `\aPPpp{f}{x}{y}`

$\left(\frac{\partial^k f}{\partial x^k}\right)$ `\aPpn{f}{x}{k}`

$\left[\frac{\partial f(x,y)}{\partial x}\right]$ `\bPp{f(x,y)}{x}`

$\left[\frac{\partial^2 f(x,y)}{\partial x^2}\right]$ `\bPPp{f(x,y)}{x}`

$\left[\frac{\partial^2 f(x,y)}{\partial x \partial y}\right]$ `\bPPpp{f(x,y)}{x}{y}`

$\left[\frac{\partial^k f(x,y)}{\partial x^k}\right]$ `\bPpn{f(x,y)}{x}{k}`

$\left\{\frac{\partial f(x,y)}{\partial x}\right\}$ `\cPp{f(x,y)}{x}`

$\left\{\frac{\partial^2 f(x,y)}{\partial x^2}\right\}$ `\cPPp{f(x,y)}{x}`

$\left\{\frac{\partial^2 f(x,y)}{\partial x \partial y}\right\}$ `\cPPpp{f(x,y)}{x}{y}`

$\left\{\frac{\partial^k f(x,y)}{\partial x^k}\right\}$ `\cPpn{f(x,y)}{x}{k}`

$\left|\frac{\partial f}{\partial x}\right|$ `\vPp{f}{x}`

$\left|\frac{\partial^2 f}{\partial x^2}\right|$ `\vPPp{f}{x}`

$\left|\frac{\partial^2 f}{\partial x \partial y}\right|$ `\vPPpp{f}{x}{y}`

$\left|\frac{\partial^k f}{\partial x^k}\right|$ `\vPpn{f}{x}{k}`

$\left\| \frac{\partial f}{\partial x} \right\|$ `\nPp{f}{x}`

$\left\| \frac{\partial^2 f}{\partial x^2} \right\|$ `\nPPp{f}{x}`

$\left\| \frac{\partial^2 f}{\partial x \partial y} \right\|$ `\nPPpp{f}{x}{y}`

$\left\| \frac{\partial^k f}{\partial x^k} \right\|$ `\nPpn{f}{x}{k}`

$\sqrt{\frac{\partial f}{\partial x}}$ `\sPp{f}{x}`

$\sqrt{\frac{\partial^2 f}{\partial x^2}}$ `\sPPp{f}{x}`

$\sqrt{\frac{\partial^2 f}{\partial x \partial y}}$ `\sPPpp{f}{x}{y}`

$\sqrt{\frac{\partial^k f}{\partial x^k}}$ `\sPpn{f}{x}{k}`

2.7.3 Enlarging brackets involving a partial differentiation

For sure, I defined the following `\newcommand`s to enlarge the $(\partial/\partial x)$-like partial differentiations:

Definitions

```
\newcommand{\App}        [1]  {\Bigg (\frac{\partial    }{\partial #1             }\Bigg )}
\newcommand{\Appp}       [1]  {\Bigg (\frac{\partial^2  }{\partial #1^2           }\Bigg )}
\newcommand{\Apppp}      [2]  {\Bigg (\frac{\partial^2  }{\partial #1  \partial #2}\Bigg )}
\newcommand{\Appn}       [2]  {\Bigg (\frac{\partial^{#2}}{\partial #1^{#2}       }\Bigg )}
```

```
\newcommand{\Bpp}        [1]  {\Bigg [\frac{\partial    }{\partial #1             }\Bigg ]}
\newcommand{\Bppp}       [1]  {\Bigg [\frac{\partial^2  }{\partial #1^2           }\Bigg ]}
\newcommand{\Bpppp}      [2]  {\Bigg [\frac{\partial^2  }{\partial #1  \partial #2}\Bigg ]}
\newcommand{\Bppn}       [2]  {\Bigg [\frac{\partial^{#2}}{\partial #1^{#2}       }\Bigg ]}
```

```
\newcommand{\Cpp}        [1]  {\Bigg\{\frac{\partial    }{\partial #1             }\Bigg\}}
\newcommand{\Cppp}       [1]  {\Bigg\{\frac{\partial^2  }{\partial #1^2           }\Bigg\}}
\newcommand{\Cpppp}      [2]  {\Bigg\{\frac{\partial^2  }{\partial #1  \partial #2}\Bigg\}}
\newcommand{\Cppn}       [2]  {\Bigg\{\frac{\partial^{#2}}{\partial #1^{#2}       }\Bigg\}}
```

```
\newcommand{\Vpp}          [1]  {\Bigg |\frac{\partial     }{\partial #1              }\Bigg |}
\newcommand{\Vppp}         [1]  {\Bigg |\frac{\partial^2   }{\partial #1^2            }\Bigg |}
\newcommand{\Vpppp}        [2]  {\Bigg |\frac{\partial^2   }{\partial #1   \partial #2}\Bigg |}
\newcommand{\Vppn}         [2]  {\Bigg |\frac{\partial^{#2}}{\partial #1^{#2}         }\Bigg |}
```

```
\newcommand{\Npp}          [1]  {\Bigg\Vert\frac{\partial     }{\partial #1              }\Bigg\Vert}
\newcommand{\Nppp}         [1]  {\Bigg\Vert\frac{\partial^2   }{\partial #1^2            }\Bigg\Vert}
\newcommand{\Npppp}        [2]  {\Bigg\Vert\frac{\partial^2   }{\partial #1   \partial #2}\Bigg\Vert}
\newcommand{\Nppn}         [2]  {\Bigg\Vert\frac{\partial^{#2}}{\partial #1^{#2}         }\Bigg\Vert}
```

Examples

$$\left(\frac{\partial}{\partial x}\right)$$ `\App{x}`

$$\left(\frac{\partial^2}{\partial x^2}\right)$$ `\Appp{x}`

$$\left(\frac{\partial^2}{\partial x \partial y}\right)$$ `\Apppp{x}{y}`

$$\left(\frac{\partial^k}{\partial x^k}\right)$$ `\Appn{x}{k}`

$$\left[\frac{\partial}{\partial x}\right]$$ `\Bpp{x}`

$$\left[\frac{\partial^2}{\partial x^2}\right]$$ `\Bppp{x}`

$$\left[\frac{\partial^2}{\partial x \partial y}\right]$$ `\Bpppp{x}{y}`

$$\left[\frac{\partial^k}{\partial x^k}\right]$$ `\Bppn{x}{k}`

$$\left\{\frac{\partial}{\partial x}\right\}$$ `\Cpp{x}`

$$\left\{\frac{\partial^2}{\partial x^2}\right\}$$ `\Cppp{x}`

$$\left\{\frac{\partial^2}{\partial x \partial y}\right\}$$ `\Cpppp{x}{y}`

$$\left\{\frac{\partial^k}{\partial x^k}\right\}$$ `\Cppn{x}{k}`

$$\left|\frac{\partial}{\partial x}\right|$$ `\Vpp{x}`

$$\left|\frac{\partial^2}{\partial x^2}\right|$$ `\Vppp{x}`

$$\left|\frac{\partial^2}{\partial x \partial y}\right|$$ `\Vpppp{x}{y}`

$$\left|\frac{\partial^k}{\partial x^k}\right|$$ `\Vppn{x}{k}`

$$\left\|\frac{\partial}{\partial x}\right\|$$ `\Npp{x}`

$$\left\|\frac{\partial^2}{\partial x^2}\right\|$$ `\Nppp{x}`

$$\left\|\frac{\partial^2}{\partial x \partial y}\right\|$$ `\Npppp{x}{y}`

$$\left\|\frac{\partial^k}{\partial x^k}\right\|$$ `\Nppn{x}{k}`

For enlarging of the $(\partial f/\partial x)$-like partial differentiations, I have

Definitions

```
\newcommand{\APp}          [2]  {\Bigg (   \frac{\partial      #1}{\partial #2              }\Bigg )   }
\newcommand{\APPp}         [2]  {\Bigg (   \frac{\partial^2    #1}{\partial #2^2            }\Bigg )   }
\newcommand{\APPpp}        [3]  {\Bigg (   \frac{\partial^2    #1}{\partial #2   \partial #3}\Bigg )   }
\newcommand{\APpn}         [3]  {\Bigg (   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\Bigg )   }
```

```
\newcommand{\BPp}       [2]  {\Bigg [   \frac{\partial      #1}{\partial #2             }\Bigg ]   }
\newcommand{\BPPp}      [2]  {\Bigg [   \frac{\partial^2    #1}{\partial #2 ^2          }\Bigg ]   }
\newcommand{\BPPpp}     [3]  {\Bigg [   \frac{\partial^2    #1}{\partial #2   \partial #3}\Bigg ]   }
\newcommand{\BPpn}      [3]  {\Bigg [   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\Bigg ]   }
```

```
\newcommand{\CPp}       [2]  {\Bigg\{   \frac{\partial      #1}{\partial #2             }\Bigg\}   }
\newcommand{\CPPp}      [2]  {\Bigg\{   \frac{\partial^2    #1}{\partial #2 ^2          }\Bigg\}   }
\newcommand{\CPPpp}     [3]  {\Bigg\{   \frac{\partial^2    #1}{\partial #2   \partial #3}\Bigg\}   }
\newcommand{\CPpn}      [3]  {\Bigg\{   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\Bigg\}   }
```

```
\newcommand{\VPp}       [2]  {\Bigg |   \frac{\partial      #1}{\partial #2             }\Bigg |   }
\newcommand{\VPPp}      [2]  {\Bigg |   \frac{\partial^2    #1}{\partial #2 ^2          }\Bigg |   }
\newcommand{\VPPpp}     [3]  {\Bigg |   \frac{\partial^2    #1}{\partial #2   \partial #3}\Bigg |   }
\newcommand{\VPpn}      [3]  {\Bigg |   \frac{\partial^{#3} #1}{\partial #2^{#3}         }\Bigg |   }
```

```
\newcommand{\NPp}       [2]  {\Bigg\Vert\frac{\partial      #1}{\partial #2             }\Bigg\Vert}
\newcommand{\NPPp}      [2]  {\Bigg\Vert\frac{\partial^2    #1}{\partial #2 ^2          }\Bigg\Vert}
\newcommand{\NPPpp}     [3]  {\Bigg\Vert\frac{\partial^2    #1}{\partial #2   \partial #3}\Bigg\Vert}
\newcommand{\NPpn}      [3]  {\Bigg\Vert\frac{\partial^{#3} #1}{\partial #2^{#3}         }\Bigg\Vert}
```

Examples

$\left(\frac{\partial f}{\partial x}\right)$	`\APp{f}{x}`
$\left(\frac{\partial^2 f}{\partial x^2}\right)$	`\APPp{f}{x}`
$\left(\frac{\partial^2 f}{\partial x \partial y}\right)$	`\APPpp{f}{x}{y}`
$\left(\frac{\partial^k f}{\partial x^k}\right)$	`\APpn{f}{x}{k}`

$\left[\frac{\partial f(x,y)}{\partial x}\right]$ `\BPp{f(x,y)}{x}`

$\left[\frac{\partial^2 f(x,y)}{\partial x^2}\right]$ `\BPPp{f(x,y)}{x}`

$\left[\frac{\partial^2 f(x,y)}{\partial x \partial y}\right]$ `\BPPpp{f(x,y)}{x}{y}`

$\left[\frac{\partial^k f(x,y)}{\partial x^k}\right]$ `\BPpn{f(x,y)}{x}{k}`

$\left\{\frac{\partial f(x,y)}{\partial x}\right\}$ `\CPp{f(x,y)}{x}`

$\left\{\frac{\partial^2 f(x,y)}{\partial x^2}\right\}$ `\CPPp{f(x,y)}{x}`

$\left\{\frac{\partial^2 f(x,y)}{\partial x \partial y}\right\}$ `\CPPpp{f(x,y)}{x}{y}`

$\left\{\frac{\partial^k f(x,y)}{\partial x^k}\right\}$ `\CPpn{f(x,y)}{x}{k}`

$\left|\frac{\partial f}{\partial x}\right|$ `\VPp{f}{x}`

$\left|\frac{\partial^2 f}{\partial x^2}\right|$ `\VPPp{f}{x}`

$\left|\frac{\partial^2 f}{\partial x \partial y}\right|$ `\VPPpp{f}{x}{y}`

$\left|\frac{\partial^k f}{\partial x^k}\right|$ `\VPpn{f}{x}{k}`

$\left\|\frac{\partial f}{\partial x}\right\|$ `\NPp{f}{x}`

$\left\|\frac{\partial^2 f}{\partial x^2}\right\|$ `\NPPp{f}{x}`

$\left\|\frac{\partial^2 f}{\partial x \partial y}\right\|$ `\NPPpp{f}{x}{y}`

$\left\|\frac{\partial^k f}{\partial x^k}\right\|$ `\NPpn{f}{x}{k}`

2.7.4 Simple types of the partial differentiations

For simple types of the partial differentiations such like

$(\partial_x f)$

I have also defined some `\newcommand`s as following:

Definitions

```
\newcommand{\ap}          [1]  {\left (    \partial      #1 \right )   }
\newcommand{\apu}         [2]  {\left (    \partial^{#2} #1 \right )   }
\newcommand{\apd}         [2]  {\left (    \partial_{#2} #1 \right )   }
```

```
\newcommand{\bp}          [1]  {\left [    \partial      #1 \right ]   }
\newcommand{\bpu}         [2]  {\left [    \partial^{#2} #1 \right ]   }
\newcommand{\bpd}         [2]  {\left [    \partial_{#2} #1 \right ]   }
```

```
\newcommand{\cp}          [1]  {\left\{    \partial      #1 \right\}   }
\newcommand{\cpu}         [2]  {\left\{    \partial^{#2} #1 \right\}   }
\newcommand{\cpd}         [2]  {\left\{    \partial_{#2} #1 \right\}   }
```

```
\newcommand{\vp}          [1]  {\left |    \partial      #1 \right |   }
\newcommand{\vpu}         [2]  {\left |    \partial^{#2} #1 \right |   }
\newcommand{\vpd}         [2]  {\left |    \partial_{#2} #1 \right |   }
```

```
\newcommand{\np}          [1]  {\left\Vert \partial      #1 \right\Vert}
\newcommand{\npu}         [2]  {\left\Vert \partial^{#2} #1 \right\Vert}
\newcommand{\npd}         [2]  {\left\Vert \partial_{#2} #1 \right\Vert}
```

```
\newcommand{\Sp}          [1]  {\sqrt {    \partial      #1        }   }
\newcommand{\spu}         [2]  {\sqrt {    \partial^{#2} #1        }   }
\newcommand{\spd}         [2]  {\sqrt {    \partial_{#2} #1        }   }
```

where the "u" and "d" stand for "up" and "down" (mean "supscript" and "subscript"), respectively. Note here that the `\newcommand` for $\sqrt{\partial f}$ is `\Sp{f}`, not `\sp{f}`. Because `\sp` and `\sb` have been defined in LaTeX for "supscript" and "subscript"!

Examples

(∂f)	`\ap{f}`
$(\partial^x f)$	`\apu{f}{x}`
$(\partial_x f)$	`\apd{f}{x}`

$[\partial f(x,y)]$	`\bp{f(x,y)}`
$[\partial^x f(x,y)]$	`\bpu{f(x,y)}{x}`
$[\partial_x f(x,y)]$	`\bpd{f(x,y)}{x}`

$\{\partial f(x,y)\}$	`\cp{f(x,y)}`
$\{\partial^x f(x,y)\}$	`\cpu{f(x,y)}{x}`
$\{\partial_x f(x,y)\}$	`\cpd{f(x,y)}{x}`

$\lvert\partial f\rvert$	`\vp{f}`
$\lvert\partial^x f\rvert$	`\vpu{f}{x}`
$\lvert\partial_x f\rvert$	`\vpd{f}{x}`

$\lVert\partial f\rVert$	`\np{f}`
$\lVert\partial^x f\rVert$	`\npu{f}{x}`
$\lVert\partial_x f\rVert$	`\npd{f}{x}`

$\sqrt{\partial f}$	`\Sp{f}`
$\sqrt{\partial^x f}$	`\spu{f}{x}`
$\sqrt{\partial_x f}$	`\spd{f}{x}`

Similar to my "A-B-C-V-N" system for enlarging of the fractions and differentiations, I defined some `\newcommand`s to enlarge the brackets and the norm suck like $[\partial f(x,y)]$ and $\lvert\partial f\rvert$.

Definitions

```
\newcommand{\Ap}          [1]  {\Big (    \partial      #1 \Big )   }
\newcommand{\Apu}         [2]  {\Big (    \partial^{#2} #1 \Big )   }
\newcommand{\Apd}         [2]  {\Big (    \partial_{#2} #1 \Big )   }
```

```
\newcommand{\Bp}          [1]  {\Big [    \partial      #1 \Big ]   }
\newcommand{\Bpu}         [2]  {\Big [    \partial^{#2} #1 \Big ]   }
\newcommand{\Bpd}         [2]  {\Big [    \partial_{#2} #1 \Big ]   }
```

```
\newcommand{\Cp}          [1]  {\Big\{    \partial      #1 \Big\}   }
\newcommand{\Cpu}         [2]  {\Big\{    \partial^{#2} #1 \Big\}   }
\newcommand{\Cpd}         [2]  {\Big\{    \partial_{#2} #1 \Big\}   }
```

```
\newcommand{\Vp}          [1]  {\Big |    \partial      #1 \Big |   }
\newcommand{\Vpu}         [2]  {\Big |    \partial^{#2} #1 \Big |   }
\newcommand{\Vpd}         [2]  {\Big |    \partial_{#2} #1 \Big |   }
```

```
\newcommand{\Np}          [1]  {\Big\Vert \partial      #1 \Big\Vert}
\newcommand{\Npu}         [2]  {\Big\Vert \partial^{#2} #1 \Big\Vert}
\newcommand{\Npd}         [2]  {\Big\Vert \partial_{#2} #1 \Big\Vert}
```

Note that the "A", "B", "C", "V", and "N" here stand not for the largest commands `\Bigg` but for the larger ones `\Big`.

Examples

$\Big(\partial f\Big)$	`\Ap{f}`
$\Big(\partial^x f\Big)$	`\Apu{f}{x}`
$\Big(\partial_x f\Big)$	`\Apd{f}{x}`

$\Big[\partial f(x,y)\Big]$	`\Bp{f(x,y)}`
$\Big[\partial^x f(x,y)\Big]$	`\Bpu{f(x,y)}{x}`
$\Big[\partial_x f(x,y)\Big]$	`\Bpd{f(x,y)}{x}`

$\Big\{\partial f(x,y)\Big\}$	`\Cp{f(x,y)}`
$\Big\{\partial^x f(x,y)\Big\}$	`\Cpu{f(x,y)}{x}`
$\Big\{\partial_x f(x,y)\Big\}$	`\Cpd{f(x,y)}{x}`

$\Big\vert\partial f\Big\vert$	`\Vp{f}`
$\Big\vert\partial^x f\Big\vert$	`\Vpu{f}{x}`
$\Big\vert\partial_x f\Big\vert$	`\Vpd{f}{x}`

$\left\|\partial f\right\|$	`\Np{f}`
$\left\|\partial^x f\right\|$	`\Npu{f}{x}`
$\left\|\partial_x f\right\|$	`\Npd{f}{x}`

2.8 Operators involving the ∇

2.8.1 Basic operators

The `\newcommand`s for the basic operators involving a ∇ have been defined as

Definitions

```
\newcommand{\del}              {\nabla}
\newcommand{\Grad}             {\nabla}
\newcommand{\Div}              {\nabla\cdot}
\newcommand{\Curl}             {\nabla\times}
\newcommand{\Lap}              {\nabla^2}
```

Examples

∇	`\del`
∇	`\Grad`
$\nabla\cdot$	`\Div`
$\nabla\times$	`\Curl`
∇^2	`\Lap`

2.8.2 `\del` family

Certainly, I have also some useful `\newcommand`s for the usual use of the operators involving a *del* in brackets, in square roots or the simple types. For the `\del` family, I defined

Definitions

```
\newcommand{\adel}         [1]  {\left (    \nabla      #1 \right )   }
\newcommand{\adelu}        [2]  {\left (    \nabla^{#2} #1 \right )   }
\newcommand{\adeld}        [2]  {\left (    \nabla_{#2} #1 \right )   }
```

```
\newcommand{\bdel}        [1]  {\left [    \nabla      #1 \right ]   }
\newcommand{\bdelu}       [2]  {\left [    \nabla^{#2} #1 \right ]   }
\newcommand{\bdeld}       [2]  {\left [    \nabla_{#2} #1 \right ]   }
```

```
\newcommand{\cdel}        [1]  {\left\{    \nabla      #1 \right\}   }
\newcommand{\cdelu}       [2]  {\left\{    \nabla^{#2} #1 \right\}   }
\newcommand{\cdeld}       [2]  {\left\{    \nabla_{#2} #1 \right\}   }
```

```
\newcommand{\vdel}        [1]  {\left |    \nabla      #1 \right |   }
\newcommand{\vdelu}       [2]  {\left |    \nabla^{#2} #1 \right |   }
\newcommand{\vdeld}       [2]  {\left |    \nabla_{#2} #1 \right |   }
```

```
\newcommand{\ndel}        [1]  {\left\Vert \nabla      #1 \right\Vert}
\newcommand{\ndelu}       [2]  {\left\Vert \nabla^{#2} #1 \right\Vert}
\newcommand{\ndeld}       [2]  {\left\Vert \nabla_{#2} #1 \right\Vert}
```

```
\newcommand{\sdel}        [1]  {\sqrt {    \nabla      #1        }   }
\newcommand{\sdelu}       [2]  {\sqrt {    \nabla^{#2} #1        }   }
\newcommand{\sdeld}       [2]  {\sqrt {    \nabla_{#2} #1        }   }
```

Examples

(∇f)	`\adel{f}`
$(\nabla^x f)$	`\adelu{f}{x}`
$(\nabla_x f)$	`\adeld{f}{x}`

$[\nabla f(x,y)]$	`\bdel{f(x,y)}`
$[\nabla^x f(x,y)]$	`\bdelu{f(x,y)}{x}`
$[\nabla_x f(x,y)]$	`\bdeld{f(x,y)}{x}`

$\{\nabla f(x,y)\}$	`\cdel{f(x,y)}`
$\{\nabla^x f(x,y)\}$	`\cdelu{f(x,y)}{x}`
$\{\nabla_x f(x,y)\}$	`\cdeld{f(x,y)}{x}`

$\vert\nabla f\vert$	`\vdel{f}`
$\vert\nabla^x f\vert$	`\vdelu{f}{x}`
$\vert\nabla_x f\vert$	`\vdeld{f}{x}`

$\Vert\nabla f\Vert$	`\ndel{f}`
$\Vert\nabla^x f\Vert$	`\ndelu{f}{x}`
$\Vert\nabla_x f\Vert$	`\ndeld{f}{x}`

$\sqrt{\nabla f}$	`\sdel{f}`
$\sqrt{\nabla^x f}$	`\sdelu{f}{x}`
$\sqrt{\nabla_x f}$	`\sdeld{f}{x}`

For enlarging of the `\del` family, I defined

Definitions

```
\newcommand{\Adel}        [1]  {\Big (    \nabla      #1 \Big )   }
\newcommand{\Adelu}       [2]  {\Big (    \nabla^{#2} #1 \Big )   }
\newcommand{\Adeld}       [2]  {\Big (    \nabla_{#2} #1 \Big )   }
```

```
\newcommand{\Bdel}        [1]  {\Big [    \nabla      #1 \Big ]   }
\newcommand{\Bdelu}       [2]  {\Big [    \nabla^{#2} #1 \Big ]   }
\newcommand{\Bdeld}       [2]  {\Big [    \nabla_{#2} #1 \Big ]   }
```

```
\newcommand{\Cdel}        [1]  {\Big\{    \nabla      #1 \Big\}   }
\newcommand{\Cdelu}       [2]  {\Big\{    \nabla^{#2} #1 \Big\}   }
\newcommand{\Cdeld}       [2]  {\Big\{    \nabla_{#2} #1 \Big\}   }
```

```
\newcommand{\Vdel}        [1]  {\Big |    \nabla      #1 \Big |   }
\newcommand{\Vdelu}       [2]  {\Big |    \nabla^{#2} #1 \Big |   }
\newcommand{\Vdeld}       [2]  {\Big |    \nabla_{#2} #1 \Big |   }
```

```
\newcommand{\Ndel}        [1]  {\Big\Vert \nabla      #1 \Big\Vert}
\newcommand{\Ndelu}       [2]  {\Big\Vert \nabla^{#2} #1 \Big\Vert}
\newcommand{\Ndeld}       [2]  {\Big\Vert \nabla_{#2} #1 \Big\Vert}
```

Note that the “A”, “B”, “C”, “V”, and “N” here stand not for the largest commands `\Bigg` but for the larger ones `\Big`.

Examples

$\Big(\nabla f\Big)$	`\Adel{f}`
$\Big(\nabla^x f\Big)$	`\Adelu{f}{x}`
$\Big(\nabla_x f\Big)$	`\Adeld{f}{x}`

$\Big[\nabla f(x,y)\Big]$	`\Bdel{f(x,y)}`
$\Big[\nabla^x f(x,y)\Big]$	`\Bdelu{f(x,y)}{x}`
$\Big[\nabla_x f(x,y)\Big]$	`\Bdeld{f(x,y)}{x}`

$\Big\{\nabla f(x,y)\Big\}$	`\Cdel{f(x,y)}`
$\Big\{\nabla^x f(x,y)\Big\}$	`\Cdelu{f(x,y)}{x}`
$\Big\{\nabla_x f(x,y)\Big\}$	`\Cdeld{f(x,y)}{x}`

$\Big\vert\nabla f\Big\vert$	`\Vdel{f}`
$\Big\vert\nabla^x f\Big\vert$	`\Vdelu{f}{x}`
$\Big\vert\nabla_x f\Big\vert$	`\Vdeld{f}{x}`

$\Big\Vert\nabla f\Big\Vert$	`\Ndel{f}`
$\Big\Vert\nabla^x f\Big\Vert$	`\Ndelu{f}{x}`
$\Big\Vert\nabla_x f\Big\Vert$	`\Ndeld{f}{x}`

2.8.3 `\Grad` family

For the `\Grad` family, I have

Definitions

```
\newcommand{\aGrad}       [1]  {\left (    \nabla      #1 \right )   }
\newcommand{\aGradu}      [2]  {\left (    \nabla^{#2} #1 \right )   }
\newcommand{\aGradd}      [2]  {\left (    \nabla_{#2} #1 \right )   }
```

```
\newcommand{\bGrad}       [1]  {\left [    \nabla      #1 \right ]   }
\newcommand{\bGradu}      [2]  {\left [    \nabla^{#2} #1 \right ]   }
\newcommand{\bGradd}      [2]  {\left [    \nabla_{#2} #1 \right ]   }
```

```
\newcommand{\cGrad}       [1]  {\left\{    \nabla      #1 \right\}   }
\newcommand{\cGradu}      [2]  {\left\{    \nabla^{#2} #1 \right\}   }
\newcommand{\cGradd}      [2]  {\left\{    \nabla_{#2} #1 \right\}   }
```

```
\newcommand{\vGrad}       [1]  {\left |    \nabla      #1 \right |   }
\newcommand{\vGradu}      [2]  {\left |    \nabla^{#2} #1 \right |   }
\newcommand{\vGradd}      [2]  {\left |    \nabla_{#2} #1 \right |   }
```

```
\newcommand{\nGrad}       [1]  {\left\Vert \nabla      #1 \right\Vert}
\newcommand{\nGradu}      [2]  {\left\Vert \nabla^{#2} #1 \right\Vert}
\newcommand{\nGradd}      [2]  {\left\Vert \nabla_{#2} #1 \right\Vert}
```

```
\newcommand{\sGrad}       [1]  {\sqrt {    \nabla      #1        }   }
\newcommand{\sGradu}      [2]  {\sqrt {    \nabla^{#2} #1        }   }
\newcommand{\sGradd}      [2]  {\sqrt {    \nabla_{#2} #1        }   }
```

Examples

(∇f)	`\aGrad{f}`
$(\nabla^x f)$	`\aGradu{f}{x}`
$(\nabla_x f)$	`\aGradd{f}{x}`

$[\nabla f(x,y)]$	`\bGrad{f(x,y)}`
$[\nabla^x f(x,y)]$	`\bGradu{f(x,y)}{x}`
$[\nabla_x f(x,y)]$	`\bGradd{f(x,y)}{x}`

$\{\nabla f(x,y)\}$	`\cGrad{f(x,y)}`
$\{\nabla^x f(x,y)\}$	`\cGradu{f(x,y)}{x}`
$\{\nabla_x f(x,y)\}$	`\cGradd{f(x,y)}{x}`

$\vGrad{f}$	`\vGrad{f}`
$\vGradu{f}{x}$	`\vGradu{f}{x}`
$\vGradd{f}{x}$	`\vGradd{f}{x}`

$\nGrad{f}$	`\nGrad{f}`
$\nGradu{f}{x}$	`\nGradu{f}{x}`
$\nGradd{f}{x}$	`\nGradd{f}{x}`

$\sGrad{f}$	`\sGrad{f}`
$\sGradu{f}{x}$	`\sGradu{f}{x}`
$\sGradd{f}{x}$	`\sGradd{f}{x}`

For enlarging of the `\Grad` family, I defined

Definitions

```
\newcommand{\AGrad}       [1]  {\Big (    \nabla      #1 \Big )   }
\newcommand{\AGradu}      [2]  {\Big (    \nabla^{#2} #1 \Big )   }
\newcommand{\AGradd}      [2]  {\Big (    \nabla_{#2} #1 \Big )   }
```

```
\newcommand{\BGrad}       [1]  {\Big [    \nabla      #1 \Big ]   }
\newcommand{\BGradu}      [2]  {\Big [    \nabla^{#2} #1 \Big ]   }
\newcommand{\BGradd}      [2]  {\Big [    \nabla_{#2} #1 \Big ]   }
```

```
\newcommand{\CGrad}       [1]  {\Big\{    \nabla      #1 \Big\}   }
\newcommand{\CGradu}      [2]  {\Big\{    \nabla^{#2} #1 \Big\}   }
\newcommand{\CGradd}      [2]  {\Big\{    \nabla_{#2} #1 \Big\}   }
```

```
\newcommand{\VGrad}       [1]  {\Big |    \nabla      #1 \Big |   }
\newcommand{\VGradu}      [2]  {\Big |    \nabla^{#2} #1 \Big |   }
\newcommand{\VGradd}      [2]  {\Big |    \nabla_{#2} #1 \Big |   }
```

```
\newcommand{\NGrad}       [1]  {\Big\Vert \nabla      #1 \Big\Vert}
\newcommand{\NGradu}      [2]  {\Big\Vert \nabla^{#2} #1 \Big\Vert}
\newcommand{\NGradd}      [2]  {\Big\Vert \nabla_{#2} #1 \Big\Vert}
```

Examples

$\left(\nabla f\right)$	`\AGrad{f}`
$\left(\nabla^x f\right)$	`\AGradu{f}{x}`
$\left(\nabla_x f\right)$	`\AGradd{f}{x}`

$\left[\nabla f(x,y)\right]$	`\BGrad{f(x,y)}`
$\left[\nabla^x f(x,y)\right]$	`\BGradu{f(x,y)}{x}`
$\left[\nabla_x f(x,y)\right]$	`\BGradd{f(x,y)}{x}`

$\left\{\nabla f(x,y)\right\}$	`\CGrad{f(x,y)}`
$\left\{\nabla^x f(x,y)\right\}$	`\CGradu{f(x,y)}{x}`
$\left\{\nabla_x f(x,y)\right\}$	`\CGradd{f(x,y)}{x}`

$\left\lvert\nabla f\right\rvert$	`\VGrad{f}`
$\left\lvert\nabla^x f\right\rvert$	`\VGradu{f}{x}`
$\left\lvert\nabla_x f\right\rvert$	`\VGradd{f}{x}`

$\left\lVert\nabla f\right\rVert$	`\NGrad{f}`
$\left\lVert\nabla^x f\right\rVert$	`\NGradu{f}{x}`
$\left\lVert\nabla_x f\right\rVert$	`\NGradd{f}{x}`

2.8.4 `\Div` family

For the normal and enlarged `\Div` family,

Definitions

```
\newcommand{\aDiv}        [1]  {\left (    \nabla\cdot #1 \right )   }
\newcommand{\bDiv}        [1]  {\left [    \nabla\cdot #1 \right ]   }
\newcommand{\cDiv}        [1]  {\left\{    \nabla\cdot #1 \right\}   }
```

```
\newcommand{\vDiv}        [1]  {\left |    \nabla\cdot #1 \right |   }
\newcommand{\nDiv}        [1]  {\left\Vert \nabla\cdot #1 \right\Vert}
\newcommand{\sDiv}        [1]  {\sqrt {    \nabla\cdot #1        }   }
```

```
\newcommand{\ADiv}        [1]  {\Big  (    \nabla\cdot #1 \Big   )   }
\newcommand{\BDiv}        [1]  {\Big  [    \nabla\cdot #1 \Big   ]   }
\newcommand{\CDiv}        [1]  {\Big \{    \nabla\cdot #1 \Big  \}   }
```

```
\newcommand{\VDiv}        [1]  {\Big  |    \nabla\cdot #1 \Big   |   }
\newcommand{\NDiv}        [1]  {\Big \Vert \nabla\cdot #1 \Big  \Vert}
```

Examples

$(\nabla \cdot \mathbf{A})$ `\aDiv{\bf A}`

$[\nabla \cdot (f\mathbf{A})]$ `\bDiv{(f {\bf A})}`

$\{\nabla \cdot (f\mathbf{A})\}$ `\cDiv{(f {\bf A})}`

$|\nabla \cdot \mathbf{A}|$ `\vDiv{\bf A}`

$\|\nabla \cdot \mathbf{A}\|$ `\nDiv{\bf A}`

$\sqrt{\nabla \cdot \mathbf{A}}$ `\sDiv{\bf A}`

$\left(\nabla \cdot \mathbf{A}\right)$ `\ADiv{\bf A}`

$\left[\nabla \cdot (f\mathbf{A})\right]$ `\BDiv{(f {\bf A})}`

$\left\{\nabla \cdot (f\mathbf{A})\right\}$ `\CDiv{(f {\bf A})}`

$\left|\nabla \cdot \mathbf{A}\right|$ `\VDiv{\bf A}`

$\left\|\nabla \cdot \mathbf{A}\right\|$ `\NDiv{\bf A}`

2.8.5 `\Curl` family

For the normal and enlarged `\Curl` family,

Definitions

```
\newcommand{\aCurl}       [1]  {\left (    \nabla\times #1 \right )   }
\newcommand{\bCurl}       [1]  {\left [    \nabla\times #1 \right ]   }
\newcommand{\cCurl}       [1]  {\left\{    \nabla\times #1 \right\}   }
```

```
\newcommand{\vCurl}       [1]  {\left |    \nabla\times #1 \right |   }
\newcommand{\nCurl}       [1]  {\left\Vert \nabla\times #1 \right\Vert}
\newcommand{\sCurl}       [1]  {\sqrt {    \nabla\times #1        }   }
```

```
\newcommand{\ACurl}       [1]  {\Big  (    \nabla\times #1 \Big   )   }
\newcommand{\BCurl}       [1]  {\Big  [    \nabla\times #1 \Big   ]   }
\newcommand{\CCurl}       [1]  {\Big \{    \nabla\times #1 \Big  \}   }
```

```
\newcommand{\VCurl}       [1]  {\Big  |    \nabla\times #1 \Big   |   }
\newcommand{\NCurl}       [1]  {\Big \Vert \nabla\times #1 \Big  \Vert}
```

Examples

$(\nabla \times \mathbf{A})$ `\aCurl{\bf A}`

$[\nabla \times (f\mathbf{A})]$ `\bCurl{(f {\bf A})}`

$\{\nabla \times (f\mathbf{A})\}$ `\cCurl{(f {\bf A})}`

$|\nabla \times \mathbf{A}|$ `\vCurl{\bf A}`

$\|\nabla \times \mathbf{A}\|$ `\nCurl{\bf A}`

$\sqrt{\nabla \times \mathbf{A}}$ `\sCurl{\bf A}`

$\Big(\nabla \times \mathbf{A}\Big)$ `\ACurl{\bf A}`

$\Big[\nabla \times (f\mathbf{A})\Big]$ `\BCurl{(f {\bf A})}`

$\Big\{\nabla \times (f\mathbf{A})\Big\}$ `\CCurl{(f {\bf A})}`

$\Big|\nabla \times \mathbf{A}\Big|$ `\VCurl{\bf A}`

$\Big\|\nabla \times \mathbf{A}\Big\|$ `\NCurl{\bf A}`

2.8.6 \Lap family

For the normal and enlarged \Lap family,

Definitions

```
\newcommand{\aLap}        [1]  {\left (    \nabla\^2 #1 \right )   }
\newcommand{\bLap}        [1]  {\left [    \nabla\^2 #1 \right ]   }
\newcommand{\cLap}        [1]  {\left\{    \nabla\^2 #1 \right\}   }
```

```
\newcommand{\vLap}        [1]  {\left |    \nabla\^2 #1 \right |   }
\newcommand{\nLap}        [1]  {\left\Vert \nabla\^2 #1 \right\Vert}
\newcommand{\sLap}        [1]  {\sqrt {    \nabla\^2 #1        }   }
```

```
\newcommand{\ALap}        [1]  {\Big  (    \nabla\^2 #1 \Big   )   }
\newcommand{\BLap}        [1]  {\Big  [    \nabla\^2 #1 \Big   ]   }
\newcommand{\CLap}        [1]  {\Big \{    \nabla\^2 #1 \Big  \}   }
```

```
\newcommand{\VLap}        [1]  {\Big  |    \nabla\^2 #1 \Big   |   }
\newcommand{\NLap}        [1]  {\Big \Vert \nabla\^2 #1 \Big  \Vert}
```

Examples

$(\nabla^2 \mathbf{A})$	\aLap{\bf A}
$[\nabla^2 (f \mathbf{A})]$	\bLap{(f {\bf A})}
$\{\nabla^2 (f \mathbf{A})\}$	\cLap{(f {\bf A})}

$\lvert\nabla^2 \mathbf{A}\rvert$	\vLap{\bf A}
$\lVert\nabla^2 \mathbf{A}\rVert$	\nLap{\bf A}
$\sqrt{\nabla^2 \mathbf{A}}$	\sLap{\bf A}

$\left(\nabla^2 \mathbf{A}\right)$	\ALap{\bf A}
$\left[\nabla^2 (f \mathbf{A})\right]$	\BLap{(f {\bf A})}
$\left\{\nabla^2 (f \mathbf{A})\right\}$	\CLap{(f {\bf A})}

$\left\lvert\nabla^2 \mathbf{A}\right\rvert$	\VLap{\bf A}
$\left\lVert\nabla^2 \mathbf{A}\right\rVert$	\NLap{\bf A}

2.9 Arrows

Almost all of the original LaTeX commands for the different arrow types in different directions are too long for a lazy man like me, except these two: `\gets` and `\to` (for ← and →). Therefore, I decided to give them shorter names. At the same time I also extended the *arrow* system.

Definitions

```
\newcommand{\lgets}             {\longleftarrow}

\newcommand{\Lgets}             {\longleftarrow \!\!\!\!- \!\!\!\!- \!\!\!\!-}
```

```
\newcommand{\Gets}              {\Leftarrow}

\newcommand{\lGets}             {\Longleftarrow}

\newcommand{\LGets}             {\Longleftarrow \!= \!= \!=}
```

Here the capital "G" stands for a arrow "with double line", and the small "l" and capital "L" stand for a "longer" and the "longest" arrows.

Examples

```
    ⟵                \lgets

   ⟵⟵⟵               \Lgets
```

```
    ⟸                \Gets

   ⟸⟸                \lGets

  ⟸⟸⟸⟸               \LGets
```

For the arrows towards to right side, you just need to change the "gets" or "Gets" to "to" or "To", respectively:

Definitions

```
\newcommand{\lto}               {\longrightarrow}

\newcommand{\Lto}               {-\!\!\!\! -\!\!\!\! -\!\!\!\! \longrightarrow}
```

```
\newcommand{\To}                {\Rightarrow}

\newcommand{\lTo}               \Longrightarrow}

\newcommand{\LTo}               {=\! =\! =\! \Longrightarrow}
```

Examples

```
    ⟶                \lto

   ⟶⟶⟶               \Lto
```

$\Rightarrow$	`\To`
$\Longrightarrow$	`\lTo`
$\Longrightarrow$	`\LTo`

Combine "gets" with "to" or "Gets" with "To", you have now the double-head arrows,

Definitions

```
\newcommand{\getsto}          {\leftrightarrow}
\newcommand{\lgetsto}         {\longleftrightarrow}
\newcommand{\Lgetsto}         {\longleftarrow \! \longrightarrow}
```

```
\newcommand{\Getsto}          {\Leftrightarrow}
\newcommand{\lGetsto}         {\Longleftrightarrow}
\newcommand{\LGetsto}         {\Longleftarrow \! \Longrightarrow}
```

Note that you don't need to (*can not*) write a command such like `\GetsTo` or `\LGetsTo` for a double-line arrow.

Examples

$\leftrightarrow$	`\getsto`
$\longleftrightarrow$	`\lgetsto`
$\longleftrightarrow$	`\Lgetsto`

$\Leftrightarrow$	`\Getsto`
$\Longleftrightarrow$	`\lGetsto`
$\Longleftrightarrow$	`\LGetsto`

Moreover, it seems for the (elementary particle) physicists very convenient and simpler to remember if we rename the upward and downward arrows as spin "up" and spin "down":

Definitions

```
\newcommand{\spinU}           {\uparrow}
\newcommand{\spinD}           {\downarrow}
```

Examples

$\uparrow$	`\spinU`
$\downarrow$	`\spinD`

2.10 Bras, kets and expectation values

In quantum mechanics we use very often the "bra" and "ket" symbols: $\langle x|$ and $|x\rangle$, it is for sure worth to define some `\newcommand`s for them:

Definitions

```
\newcommand{\bra}          [1]  {\langle {\textstyle{#1}} |      }
\newcommand{\ket}          [1]  {      | {\textstyle{#1}} \rangle}
```

```
\newcommand{\Bra}          [1]  {\left < {          {#1}} \right|}
\newcommand{\Ket}          [1]  {\left | {          {#1}} \right>}
```

As usual, I used here the capital "B" and "K" for the cases with larger arguments.

Examples

$\langle\psi\|$	`\bra{\psi}`
$\|\psi\rangle$	`\ket{\psi}`

$\left\langle\psi^0\right\|$	`\Bra{\psi^0}`
$\left\|\psi^0\right\rangle$	`\Ket{\psi^0}`

Certainly, I considered the cases of the bra and ket symbols with two or three arguments.

Definitions

```
\newcommand{\Ylmstar}      [2]  {\langle{\textstyle{#1}~{#2}     }|      }
\newcommand{\Ylm}          [2]  {      |{\textstyle{#1}~{#2}     }\rangle}
```

```
\newcommand{\nlmstar}      [3]  {\langle{\textstyle{#1}~{#2}~{#3}}|      }
\newcommand{\nlm}          [3]  {      |{\textstyle{#1}~{#2}~{#3}}\rangle}
```

where I also borrowed the terminology from quantum mechanics and "star" stands for the $*$ as a supscript (indicates a conjugate partner in QM).

Examples

$\langle l\ m\|$	`\Ylmstar{l}{m}`
$\|l\ m\rangle$	`\Ylm{l}{m}`

$\langle n\ l\ m\|$	`\nlmstar{n}{l}{m}`
$\|n\ l\ m\rangle$	`\nlm{n}{l}{m}`

Moreover, I defined some \newcommands for the inner product of a pair bra and ket and for expectation values:

Definitions

```
\newcommand{\braket}      [2]  {\langle{\textstyle{#1}     |{#2}           }\rangle}
\newcommand{\innerP}      [2]  {\langle{\textstyle{#1}     |{#2}           }\rangle}
```

```
\newcommand{\expv}        [1]  {\langle{\textstyle          {#1}           }\rangle}
\newcommand{\Expv}        [1]  {\left<                      {#1}            \right>}
```

```
\newcommand{\expV}        [3]  {\langle{\textstyle{#1}     |{#2}|      {#3}}\rangle}
\newcommand{\ExpV}        [3]  {\left<            {#1}\left|{#2}\right|{#3} \right>}
```

Here the capital "E" stands for the larger argument or arguments, and the small "v" or the capital "V" stand for "without" or "with" the two wave functions.

Examples

$\langle\psi\|\phi\rangle$	\braket{\psi}{\phi}
$\langle\psi\|\phi\rangle$	\innerP{\psi}{\phi}

$\langle x\rangle$	\expv{x}
$\left\langle \frac{p^2}{2m} \right\rangle$	\Expv{\frac{p^2}{2m}}

$\langle\psi\|x\|\phi\rangle$	\expV{\psi}{x}{\phi}
$\left\langle \psi \middle\| \frac{p^2}{2m} \middle\| \psi \right\rangle$	\ExpV{\psi}{\frac{p^2}{2m}}{\phi}

2.11 Atomic symbols

For the atomic symbols such like ${}^{A}X$ or ${}^{A}_{Z}X$, I defined the following \newcommands:

Definitions

```
\newcommand{\XA}          [2]  {\sp{#2}       {    #1}}
\newcommand{\XAZ}         [3]  {\sp{#2}\sb{#3}{    #1}}
```

```
\newcommand{\rmXA}        [2]  {\sp{#2}       {\rm #1}}
\newcommand{\rmXAZ}       [3]  {\sp{#2}\sb{#3}{\rm #1}}
```

```
\newcommand{\bfXA}          [2]  {\sp{#2}       {\bf #1}}

\newcommand{\bfXAZ}         [3]  {\sp{#2}\sb{#3}{\bf #1}}
```

Here the "X", "A", and "Z" stand for the name, the atomic number, and the number of protons of the element, and, as usual, I used "rm" and "bf" for the "roman" and "bold face" print types. Note that I modified the definitions of the above `\newcommand`s in `Version 4.0`, but the commands and results are unchanged. Thus, if you use my `clshan-math` package directly, you have to worry about nothing!

Examples

${}^{4}He$	`\XA{He}{4}`
${}^{4}_{2}He$	`\XAZ{He}{4}{2}`

${}^{4}\mathrm{He}$	`\rmXA{He}{4}`
${}^{4}_{2}\mathrm{He}$	`\rmXAZ{He}{4}{2}`

${}^{4}\mathbf{He}$	`\bfXA{He}{4}`
${}^{4}_{2}\mathbf{He}$	`\bfXAZ{He}{4}{2}`

Note here that, if you want to type some elements such like ${}^{12}_{6}C$ or ${}^{127}_{53}I$, you need to type `\~` for a small space in the third (lower) argument: `$\XAZ{C}{12}{\~6}$`, `$\XAZ{I}{127}{\~53}$`. On the other hand, for some special expressions in the nuclear physics, I have

Definitions

```
\newcommand{\slj}           [3]  {       \sp{#1} {#2}_{#3}}

\newcommand{\nslj}          [4]  {{#1}~\!\sp{#2} {#3}_{#4}}
```

Note that the definitions of the above `\newcommand`s have been also modified in `Version 4.0`.

Examples

${}^{2}P$	`\slj{2}{P}{}`
${}^{2}P_{1/2}$	`\slj{2}{P}{1/2}`
$2\,{}^{1}S_{0}$	`\nslj{2}{1}{S}{0}`

And, for the "norder" symbol in the quantum field theory,

Definition

```
\newcommand{\Norder}        [1]  {:\!#1\!:}
```

Example

$:\phi_1:$	`\Norder{\phi_1}`

2.12 Traces

In the quantum field theory, the trace of a matrix or a product of a few matrices has been always calculated. This means that I should define some shorter commands for them.

Definitions

```
\newcommand{\tr}                {{\it tr}}
\newcommand{\Tr}                {{\it Tr}}
```

```
\newcommand{\rmtr}              {{\rm tr}}
\newcommand{\rmTr}              {{\rm Tr}}
```

```
\newcommand{\bftr}              {{\bf tr}}
\newcommand{\bfTr}              {{\bf Tr}}
```

where the "rm" and "bf" stand for "roman" and "bold face" print types.

Examples

tr	`\tr`
Tr	`\Tr`

tr	`\rmtr`
Tr	`\rmTr`

tr	`\bftr`
Tr	`\bfTr`

2.13 Slashs

Like the `Tr`s, in the quantum field theory and the elementary particle physics, you can always find some *slash*'s of 4-momenta. So, just define some `\newcommand`s:

Definitions

```
\newcommand{\xslash}       [1]  {\mbox{$\not{\hspace{-0.4ex} #1 \~  }$}}
\newcommand{\xpslash}      [1]  {\mbox{$\not{\hspace{-0.4ex} #1 \~' }$}}
\newcommand{\xdpslash}     [1]  {\mbox{$\not{\hspace{-0.4ex} #1 \~''}$}}
```

Here “p” stands for “prime” and “dp” stands for “double prime”.

Examples

$\not{k}$	`\xslash{k}`
$\not{p}'$	`\xpslash{p}`
$\not{q}''$	`\xdpslash{q}`

Moreover, when Prof. Ling-Lie Chau visited the National Cheng Kung University where I was working at, and prepared her lecture on the quantum field theory, or more exactly, on the “discrete symmetry breaking”, she asked for LaTeX commands for typing some special abbreviations such like $\not{C}$, $\not{P}$, $\not{CP}$, or even $\not{CPT}$. Based on my experience of defining the `\cancel`, `\eliminate`, and `\equalto` commands (see the next section), I gave her the following `\newcommand`s for this interesting challenge:

Definitions

```
\newcommand{\Xslash}       [1]  {\setlength{\unitlength}{2.5ex}
                                 \raisebox{-0.5ex}{%
                                 \begin{picture}(1.3,1)
                                 \put(0   ,0){\makebox(1.2,1  ){$\displaystyle #1$}}
                                 \put(0.15,0){\makebox(0.8,1  ){\line(3,2){1.1}}}
                                 \end{picture}%
                                 }}
```

```
\newcommand{\XYslash}      [1]  {\setlength{\unitlength}{2.5ex}
                                 \raisebox{-0.35ex}{%
                                 \begin{picture}(1.3,1)
                                 \put(0   ,0){\makebox(1.9,1  ){$\displaystyle #1$}}
                                 \put(0.15,0){\makebox(1.6,1  ){\line(3,1){1.8}}}
                                 \end{picture}%
                                 }}
```

```
\newcommand{\XYZslash}     [1]  {\setlength{\unitlength}{2.5ex}
                                 \raisebox{-0.45ex}{%
                                 \begin{picture}(1.3,1)
                                 \put(0   ,0){\makebox(2.7,1  ){$\displaystyle #1$}}
                                 \put(0.15,0){\makebox(2.4,1  ){\line(5,1){2.45}}}
                                 \end{picture}%
                                 }}
```

Here “X”, “XY”, and “XYZ” stand for that “one” “two”, or “three” “capital” letters should be combined together under the “/ (slash)” sign.

Examples

$\not{C}$	`\Xslash{C}`
$\not{CP}$	`\XYslash{CP}`
$\not{CPT}$	`\XYZslash{CPT}`

2.14 \eliminate, \equalto, and \cancel

Sometimes we want to show an elimination clearly such like

$$\sqrt{Q}\left[\frac{1}{F^2(Q)}\left(\frac{dR}{dQ}\right)\right]_0^{\infty} - \frac{1}{2}\int_0^{\infty}\frac{1}{\sqrt{Q}}\left[\frac{1}{F^2(Q)}\left(\frac{dR}{dQ}\right)\right]dQ \tag{1}$$

One of my former German colleague in the Physikalisches Institut der Universität Bonn, Dr. Markus Bernhardt, asked me for a solution and one day later I gave him my definition:

Definition

```
\newcommand{\eliminate}    [6]  {\setlength{\unitlength}{1cm}
                                 \raisebox{0.5ex}{
                                 \begin{picture}(#2,0)
                                 \put(0,0){\makebox(#2,#6){$\displaystyle #1$}}
                                 \put(0,0){\makebox(#2,#6){\vector(#3,1){#4}}}
                                 \put(0,0){\makebox(#2,#5){\hspace{#4 cm}
                                                           \hspace{1em}{\small 0}}}
                                 \end{picture}
                                 }}
```

Here the arguments have been defined as

Arguments

#1: the term in this equation which you want to "eliminate".
#2: the width of the treated term.
#3: the direction of the arrow, there are four choices: 1, 2, 3, 4.
#4: the length of the projection of the arrow on the x-axis, usually can be set to be equal to "#3".
#5: the height of the "0", usually can be set to be between "0.9" and "1.2".
#6: a fine tune of the height of the treated term, usually can be set to be between "0" and "0.1".
Lengths must be given in unit of cm, but without the unit.

Note that, first, the suggestions for values of the arguments #4, #5, and #6 here can not be suitable for every case, I just want to give you an idea how large these values could approximately be, so that you can adjust them more easily. Second, I set here the unit length to be 1 cm and all arguments of the `\newcommand`s defined in this section for lengths must be given *in unit of "cm"* and the unit, cm, must be neglected. As a good example I give you here the command which I used for the first part of the equation above:

Example

```
\eliminate{\sqrt{Q} \left[......\right]}{3.32}{2}{3}{1.6}{0.05}
```

Similarly, sometimes we want to show a simple value, for example 1 or -1, of a complicate part of one equation more clearly, then we can use a `\newcommand` defined as

Definition

```
\newcommand{\equalto}      [7]  {\setlength{\unitlength}{1cm}
                                  \raisebox{0.5ex}{
                                  \begin{picture}(#3,0)
                                  \put(0,0){\makebox(#3,#7){$\displaystyle #1$}}
                                  \put(0,0){\makebox(#3,#7){\vector(#4,1){#5}}}
                                  \put(0,0){\makebox(#3,#6){\hspace{#5 cm}
                                                            \hspace{1em}{\small #2}}}
                                  \end{picture}
                                  }}
```

Here the arguments have been defined as

Arguments

#1: the term in this equation which is "equal to" a special value.
#2: the value to which the treated term is equal.
#3: the width of the treated term.
#4: the direction of the arrow, there are four choices: 1, 2, 3, 4.
#5: the length of the projection of the arrow on the x-axis, usually can be set to be equal to "#4".
#6: the height of the argument "#2", usually can be set to be between "0.9" and "1.2".
#7: a fine tune of the height of the treated term, usually can be set to be between "0" and "0.1".
Lengths must be given in unit of cm, but without the unit.

Note that, first, values of the arguments #4, #5, and #6 given here are just suggestions; second, the value which you want to specify must be given as the *second* argument (#2). Then the command in the example for `\eliminate` can be now rewritten as

Example

```
\equalto{\sqrt{Q} \left[......\right]}{0}{3.32}{2}{3}{1.6}{0.05}
```

Moreover, if you just want to "cancel" a term in the equation, but don't want to write a "0" there, I defined also a `\newcommand` for this case:

Definition

```
\newcommand{\cancel}       [5]  {\setlength{\unitlength}{1cm}
                                  \raisebox{0.5ex}{
                                  \begin{picture}(#2,0)
                                  \put(0,0){\makebox(#2,#5){$\displaystyle #1$}}
                                  \put(0,0){\makebox(#2,#5){\line(#3,1){#4}}}
                                  \end{picture}
                                  }}
```

Here the arguments have been defined as

Arguments

#1: the term in this equation which you want to "cancel".
#2: the width of the treated term.
#3: the direction of the oblique line, there are four choices: 1, 2, 3, 4.
#4: the length of the projection of the oblique line on the x-axis, usually can be set to be equal to "#3".
#5: a fine tune of the height of the treated term, usually can be set to be between "0" and "0.1".
Lengths must be given in unit of cm, but without the unit.

So you can use the following command to rewrite the equation above

Example

```
\cancel{\sqrt{Q} \left[......\right]}{3.32}{2}{3}{0.05}
```

and get that

$$\cancel{\sqrt{Q}\left[\frac{1}{F^2(Q)}\left(\frac{dR}{dQ}\right)\right]_0^\infty} - \frac{1}{2}\int_0^\infty \frac{1}{\sqrt{Q}}\left[\frac{1}{F^2(Q)}\left(\frac{dR}{dQ}\right)\right] dQ$$

2.15 Miscellaneous

For the geometry, we need some expressions such like $\overline{AB}$ or $A_{\arg}$. I'm too lazy to type long commands but like to give then a new (and shorter) name.

Definitions

```
\newcommand{\Line}              {\overline}
\newcommand{\arg}               {{/\!\!/}}
```

Examples

$\overline{AB}$	`\Line{AB}`
$A_{\arg}$	`A_{\arg}`

Similarly, I also defined a shorter `\newcommand` for the summation symbol with two subscripts:

Definition

```
\newcommand{\sumd}          [2]  {\sum_{\stackrel{\scriptstyle #1}{#2}}}
```

where the "d" stands for "double" subscripts.

Example

$\sum_{\substack{i=1 \\ i\neq j}}^{N}$	`\sumd{i=1}{i \ne j}^{N}`

Chapter 3

Matrices

I defined a few basic matrices in quantum mechanics and high energy physics in my `clshan-matrix` package.

3.1 Identity matrices

The 2×2, 3×3, and 4×4 identity matrices:

$$\mathbf{I}_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \qquad \texttt{\textbackslash Identityb}$$

$$\mathbf{I}_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \qquad \texttt{\textbackslash Identityc}$$

$$\mathbf{I}_4 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad \texttt{\textbackslash Identityd}$$

have been defined as following:

Definitions

```
\newcommand{\Identityb}         {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c}
                                   1~ & ~0 \\
                                   0~ & ~1
                                  \end{array}
                                 \right]}
```

```
\newcommand{\Identityc}         {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c c}
                                   ~1~ & 0~ & 0~ \\
                                   ~0~ & 1~ & 0~ \\
                                   ~0~ & 0~ & 1~
                                  \end{array}
                                 \right]}
```

```
\newcommand{\Identityd}         {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c c c}
                                   ~1~ & 0~ & 0~ & 0~ \\
                                   ~0~ & 1~ & 0~ & 0~ \\
                                   ~0~ & 0~ & 1~ & 0~ \\
                                   ~0~ & 0~ & 0~ & 1~
                                  \end{array}
                                 \right]}
```

where I used the letter "b", "c", or "d" to indicate "2", "3", or "4", because we can not define `\newcommand`s involving numbers... On the other hand, sometimes we need a matrix with vectors or smaller identity matrices as elements. Hence, I defined these identity matrices:

$$\begin{bmatrix} \mathbf{1} & 0 \\ 0 & \mathbf{1} \end{bmatrix}$$ `\IdentityB`

$$\begin{bmatrix} \mathbf{1} & 0 & 0 \\ 0 & \mathbf{1} & 0 \\ 0 & 0 & \mathbf{1} \end{bmatrix}$$ `\IdentityC`

Definitions

```
\newcommand{\IdentityB}         {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c}
                                   {\bf 1}~ &      0 \\
                                         0 ~ & {\bf 1}
                                  \end{array}
                                 \right]}
```

```
\newcommand{\IdentityC}          {\renewcommand{\arraystretch}{1.5}
                                  \left[
                                   \begin{array}{c c c}
                                    {\bf 1}~ &      0 ~ &      0  \\
                                         0 ~ & {\bf 1}~ &      0  \\
                                         0 ~ &      0 ~ & {\bf 1}
                                   \end{array}
                                  \right]}
```

Note here that I *didn't* define an `\IdentityD` matrix.

3.2 Pauli matrices

The three Pauli matrices:

$$\sigma_x = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix} \qquad \texttt{\textbackslash Paulix}$$

$$\sigma_y = \begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix} \qquad \texttt{\textbackslash Pauliy}$$

$$\sigma_z = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} \qquad \texttt{\textbackslash Pauliz}$$

have also been defined:

Definitions

```
\newcommand{\Paulix}             {\renewcommand{\arraystretch}{1.5}
                                  \left[
                                   \begin{array}{c c}
                                    0~ & ~1 \\
                                    1~ & ~0
                                   \end{array}
                                  \right]}
```

```
\newcommand{\Pauliy}             {\renewcommand{\arraystretch}{1.5}
                                  \left[
                                   \begin{array}{c c}
                                    0 & -i \\
                                    i &  0
                                   \end{array}
                                  \right]}
```

```
\newcommand{\Pauliz}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                 1 &  0 \\
                                 0 & -1
                                \end{array}
                               \right]}
```

Note that I use `\Paulix`, `\Pauliy`, and `\Pauliz` for these three "Pauli" matrices, although the physicists use usually σ_x, σ_y, and σ_z to denote them.

3.3 Dirac γ matrices

The system of the Dirac γ matrices is a little complicate. First, the γ^1 to γ^3:

$$\gamma^1 = \begin{bmatrix} 0 & \sigma_x \\ -\sigma_x & 0 \end{bmatrix} \qquad \texttt{\textbackslash gammaa}$$

$$\gamma^2 = \begin{bmatrix} 0 & \sigma_y \\ -\sigma_y & 0 \end{bmatrix} \qquad \texttt{\textbackslash gammab}$$

$$\gamma^3 = \begin{bmatrix} 0 & \sigma_z \\ -\sigma_z & 0 \end{bmatrix} \qquad \texttt{\textbackslash gammac}$$

have been defined as

Definitions

```
\newcommand{\gammaa}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                  0        & \sigma_x \\
                                 -\sigma_x & 0
                                \end{array}
                               \right]}
```

```
\newcommand{\gammab}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                  0        & \sigma_y \\
                                 -\sigma_y & 0
                                \end{array}
                               \right]}
```

```
\newcommand{\gammac}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                  0        & \sigma_z \\
                                 -\sigma_z & 0
                                \end{array}
                               \right]}
```

where I used, as usual, "a", "b", and "c" to indicate "1", "2", and "3". Note that I used here `\gammaa`, `\gammab`, and so on for these Dirac "gamma" matrices (not `\Diraca`, `\Diracb`, etc...). Moreover, for a general case, I have these two choices:

$$\gamma^i = \begin{bmatrix} 0 & \sigma^i \\ -\sigma^i & 0 \end{bmatrix}$$ `\gammai`

$$\gamma^\mu = \begin{bmatrix} 0 & \sigma^\mu \\ -\sigma^\mu & 0 \end{bmatrix}$$ `\gammax{\mu}`

Note here that the command `\gammai` is fixed as above. This means that, if you need a matrix such as

$$\begin{bmatrix} 0 & \sigma^j \\ -\sigma^j & 0 \end{bmatrix}$$

or

$$\begin{bmatrix} 0 & \sigma^a \\ -\sigma^a & 0 \end{bmatrix}$$

you have to use the command `\gammax{j}` or `\gammax{a}`.

Definitions

```
\newcommand{\gammai}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                   0       & \sigma^i \\
                                  -\sigma^i &  0
                                \end{array}
                               \right]}
```

```
\newcommand{\gammax}       [1] {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                   0          & \sigma^{#1} \\
                                  -\sigma^{#1} &  0
                                \end{array}
                               \right]}
```

Certainly, it is useful to define `\newcommand`s for matrices involving the momentum or the 4-momentum:

$$\begin{bmatrix} 0 & \boldsymbol{\sigma} \\ -\boldsymbol{\sigma} & 0 \end{bmatrix}$$

```
\gammaV
```

$$\begin{bmatrix} 0 & \boldsymbol{\sigma}\cdot\mathbf{p} \\ -\boldsymbol{\sigma}\cdot\mathbf{p} & 0 \end{bmatrix}$$

```
\gammaVx{p}
```

$$\begin{bmatrix} E_p & -\boldsymbol{\sigma}\cdot\mathbf{p} \\ \boldsymbol{\sigma}\cdot\mathbf{p} & -E_p \end{bmatrix}$$

```
\gammaVX{E_p}{p}
```

Definitions

```
\newcommand{\gammaV}           {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c}
                                   0           & \bfG{\sigma} \\
                                  -\bfG{\sigma} &  0
                                 \end{array}
                                \right]}
```

```
\newcommand{\gammaVx}      [1]  {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c}
                                    0                       & \bfG{\sigma}\cdot{\bf #1} \\
                                   -\bfG{\sigma}\cdot\bf {#1} &  0
                                  \end{array}
                                 \right]}
```

```
\newcommand{\gammaVX}      [2]  {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c}
                                    #1                      & -\bfG{\sigma}\cdot{\bf #2} \\
                                   \bfG{\sigma}\cdot\bf {#2} & -#1
                                  \end{array}
                                 \right]}
```

On the other hand, there are two different definitions for γ^0 and therefore also two for γ^5:

$$\gamma^0 = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$$ \gammaz

$$\gamma^0 = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$$ \gammaZ

$$\gamma^5 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$$ \gammae

$$\gamma^5 = \begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$$ \gammaE

where the "z" and "Z" stand for "zero", and the "e" and "E" indicate "5".

Definitions

```
\newcommand{\gammaz}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                 1 &  0 \\
                                 0 & -1
                                \end{array}
                               \right]}
```

```
\newcommand{\gammaZ}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                  0 & 1 \\
                                 -1 & 0
                                \end{array}
                               \right]}
```

```
\newcommand{\gammae}          {\renewcommand{\arraystretch}{1.5}
                               \left[
                                \begin{array}{c c}
                                 0~ & ~1 \\
                                 1~ & ~0
                                \end{array}
                               \right]}
```

```
\newcommand{\gammaE}            {\renewcommand{\arraystretch}{1.5}
                                 \left[
                                  \begin{array}{c c}
                                   -1 & 0 \\
                                    0 & 1
                                  \end{array}
                                 \right]}
```

3.4 Gell-Mann λ matrices

The eight Gell-Mann λ matrices:

$$\lambda^1 = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

```
\lambdaa
```

$$\lambda^2 = \begin{bmatrix} 0 & -i & 0 \\ i & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

```
\lambdab
```

$$\lambda^3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

```
\lambdac
```

$$\lambda^4 = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$

```
\lambdad
```

$$\lambda^5 = \begin{bmatrix} 0 & 0 & -i \\ 0 & 0 & 0 \\ i & 0 & 0 \end{bmatrix}$$

```
\lambdae
```

$$\lambda^6 = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$ `\lambdaf`

$$\lambda^7 = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -i \\ 0 & i & 0 \end{bmatrix}$$ `\lambdag`

$$\lambda^8 = \frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -2 \end{bmatrix}$$ `\lambdah`

have also been defined with the commands `\lambdaa`, `\lambdab`, ..., `\lambdah`.

Definitions

```
\newcommand{\lambdaa}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0~ & 1~ & 0~ \\
                                  ~1~ & 0~ & 0~ \\
                                  ~0~ & 0~ & 0~
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdab}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0  & -i & 0~ \\
                                  ~i  &  0 & 0~ \\
                                  ~0  &  0 & 0~
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdac}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~1  &  0 & 0~ \\
                                  ~0  & -1 & 0~ \\
                                  ~0  &  0 & 0~
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdad}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0~ & 0~ & 1~ \\
                                  ~0~ & 0~ & 0~ \\
                                  ~1~ & 0~ & 0~
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdae}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0~ & 0 & -i \\
                                  ~0~ & 0 &  0 \\
                                  ~i~ & 0 &  0
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdaf}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0~ & 0~ & 0~ \\
                                  ~0~ & 0~ & 1~ \\
                                  ~0~ & 1~ & 0~
                                 \end{array}
                                \right]}
```

```
\newcommand{\lambdag}          {\renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~0~ & 0 &  0 \\
                                  ~0~ & 0 & -i \\
                                  ~0~ & i &  0
                                 \end{array}
                                \right]}
```

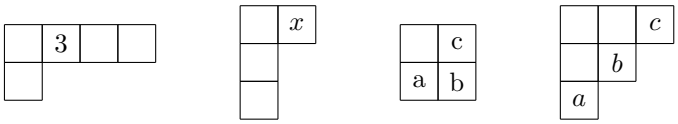
```
\newcommand{\lambdah}          {\frac{1}{\sqrt{3}}
                                \renewcommand{\arraystretch}{1.5}
                                \left[
                                 \begin{array}{c c c}
                                  ~1~ & 0 &  0 \\
                                  ~0~ & 1 &  0 \\
                                  ~0~ & 0 & -2
                                 \end{array}
                                \right]}
```

Here I used “a”, “b”, ..., “h” to indicate “1”, “2”, ..., “8”.

Chapter 4

Young Tableaux

For elementary particle physicists it is very convenient and useful to use the "Young Tableaux" such like



One of my former German colleague in the Physikalisches Institut der Universität Bonn, Dr. Ulrich Langenfeld, wanted to give the students some exercises about these "boxes" and asked me how we can draw these boxes in LaTeX. I gave him my solutions which I made earlier (Section 4.1). But I am actually not satisfied with them because they are still too complicate (at least for a lazy guy like me!)... So I decided to improve my definitions and two days later I have a set of very simpler `\newcommand`s (Section 4.2).

Note that, before you use my `clshan-YoungTableaux` package, you have to set up three parameters as following:

Setup before usepackage

```
\def \Youngunit {0.5cm}
\def \YoungsepT {0.05cm}
\def \YoungsepB {0.1 cm}
\usepackage{clshan-YoungTableaux}
```

Here the `\Youngunit` indicates the size of one box in the Young Tableaux, the `\YoungsepT` and `\YoungsepB` indicate the vertical separations between the Young Tableaux and the text in the last and the next lines, where the "T" and "B" stand for "top" and "bottom". The set up of these three parameters given above is just my suggestions. For sure you can choose your favorite size and distances of separations.

4.1 Putting the boxes one-by-one

About three years ago I defined the following `\newcommand` in order to draw the Young Tableaux when I did some exercises about it:

Definition

```
\newcommand{\Young}        [2]  {\begin{minipage}{#1}
                                  \setlength{\unitlength}{\Youngunit}
                                  \begin{center}
                                  \vspace{\YoungsepT}
                                  \begin{picture}
                                   {#2}
                                  \end{picture}
                                  \vspace{\YoungsepB}
                                  \end{center}
                                  \end{minipage}}
```

Here the argument #1 is the width of the place where you put your boxes. I used the `minipage` environment here because I want to fix the Young Tableaux in the center of the line where it is. Note that, not like what I usually did for my other `\newcommand`s, you need to give the unit of the length, e.g. cm or in, here. Meanwhile, the argument #2 above has two parts: the first part indicates the size of a Young Tableaux and have to be given as (n_x, n_y), where n_x and n_y are the maximum number of boxes in the horizontal and vertical directions; the second part is a set of commands which indicates the positions of the boxes. You have two choices for indicating the position of *one box*:

Definitions

```
\newcommand{\pbox}         [1]  {\put #1 {\usebox{\Youngbox}}}
```

```
\newcommand{\pboxX}        [2]  {\put #1 {\usebox{\Youngbox}}
                                  \put #1 {\makebox(-1,-1){#2}}}
```

```
\setlength{\unitlength}{\Youngunit}
\newsavebox{\Youngbox}
\savebox{\Youngbox}(1,1){
\begin{picture}(1,1)
\put( 0, 0){\line( 0,-1){1}}
\put( 0,-1){\line(-1, 0){1}}
\put(-1,-1){\line( 0, 1){1}}
\put(-1, 0){\line( 1, 0){1}}
\end{picture}
}
```

Here "pbox" means "put a box" and "pboxX" means "put a box with something X". You can use the `\pbox` to put just a box and/or the `\pboxX` to put a box with a label therein. The expression of the position of a box is just like in the coordinate plane, the box in the bottom-left corner is (1,1) and the box in the top-right corner is (n_x, n_y). As example I give you here the commands for the four Young Tableaux above.

Examples

```
\Young{3  cm}{(4,2) \pbox {(1,2)}      \pboxX{(2,2)}{ 3 } \pbox{(3,2)}      \pbox{(4,2)}
                    \pbox {(1,1)}}
```

```
\Young{2  cm}{(2,3) \pbox {(1,3)}      \pboxX{(2,3)}{$3$}
                    \pbox {(1,2)}
                    \pbox {(1,1)}}
```

```
\Young{2  cm}{(2,2) \pbox {(1,2)}      \pboxX{(2,2)}{ c }
                    \pboxX{(1,1)}{ a } \pboxX{(2,1)}{ b }}
```

```
\Young{2.5cm}{(3,3) \pbox {(1,3)}      \pbox {(2,3)}      \pbox{(3,3)}{$c$}
                    \pbox {(1,2)}      \pboxX{(2,2)}{$b$}
                    \pboxX{(1,1)}{$a$}}
```

4.2 Putting the boxes row-by-row or column-by-column

As mentioned above, the combination of the `\Young` command with the `\pbox` and `\pboxX` commands is not simple enough for me. Thus I took almost two days for finding a better solution. After that, now you have the following `\newcommand`s to draw the Young Tableaux row-by-row or column-by-column.

4.2.1 Young Tableaux with a horizontal form

For a Young Tableaux having generally a horizontal form, or, in other words, $n_x > n_y$, e.g. the first one of the four examples above, it is better to draw it row-by-row with the following `\newcommand`s:

Definitions

```
\newcommand{\younghaX}     [3]  {\Young{#1}{(#2,1)
                                   \mhpbox{1}{#2}
                                   #3}}
```

```
\newcommand{\younghbX}     [4]  {\Young{#1}{(#2,2)
                                   \mhpbox{2}{#2}
                                   \mhpbox{1}{#3}
                                   #4}}
```

```
\newcommand{\younghcX}     [5]  {\Young{#1}{(#2,3)
                                   \mhpbox{3}{#2}
                                   \mhpbox{2}{#3}
                                   \mhpbox{1}{#4}
                                   #5}}
```

```
\newcommand{\younghdX}     [6]  {\Young{#1}{(#2,4)
                                   \mhpbox{4}{#2}
                                   \mhpbox{3}{#3}
                                   \mhpbox{2}{#4}
                                   \mhpbox{1}{#5}
                                   #6}}
```

```
\newcommand{\YoungheX}     [7]  {\Young{#1}{(#2,5)
                                           \mhpbox{5}{#2}
                                           \mhpbox{4}{#3}
                                           \mhpbox{3}{#4}
                                           \mhpbox{2}{#5}
                                           \mhpbox{1}{#6}
                                           #7}}
```

```
\newcommand{\YounghfX}     [8]  {\Young{#1}{(#2,6)
                                           \mhpbox{6}{#2}
                                           \mhpbox{5}{#3}
                                           \mhpbox{4}{#4}
                                           \mhpbox{3}{#5}
                                           \mhpbox{2}{#6}
                                           \mhpbox{1}{#7}
                                           #8}}
```

```
\newcommand{\YounghgX}     [9]  {\Young{#1}{(#2,7)
                                           \mhpbox{7}{#2}
                                           \mhpbox{6}{#3}
                                           \mhpbox{5}{#4}
                                           \mhpbox{4}{#5}
                                           \mhpbox{3}{#6}
                                           \mhpbox{2}{#7}
                                           \mhpbox{1}{#8}
                                           #9}}
```

```
\newcommand{\mhpbox}       [2]  {\multiput(1,#1)(1,0){#2}{\usebox{\Youngbox}}}
```

Here the argument #1 for commands `\YounghaX`, `\YounghbX`, ..., `\YounghgX`, is the width of the place where you put your boxes and have to be given with its unit, the "h" means that the general form of these boxes is horizonal, the "a", "b", ..., or "g" indicates the number of row (for "1", "2", ..., or "7"), and the "X" means that you can use the following `\newcommand` to label some of the boxes:

Definition

```
\newcommand{\Younglabel}   [2]  {\put #1 {\makebox(-1,-1){#2}}}
```

Thus the first of the four examples above can be rewritten as

Example

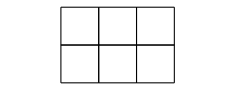
```
\YounghbX{3cm}{4}{1}{\Younglabel{(2,2)}{3}}
```

Meanwhile, if you don't want to label any box, you can use the following `\newcommand`s:

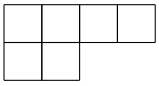
Definitions

```
\newcommand{\Youngha}      [2]  {\YounghaX{#1}{#2}{}}
\newcommand{\Younghb}      [3]  {\YounghaX{#1}{#2}{#3}{}}
\newcommand{\Younghc}      [4]  {\YounghaX{#1}{#2}{#3}{#4}{}}
\newcommand{\Younghd}      [5]  {\YounghaX{#1}{#2}{#3}{#4}{#5}{}}
\newcommand{\Younghe}      [6]  {\YounghaX{#1}{#2}{#3}{#4}{#5}{#6}{}}
\newcommand{\Younghf}      [7]  {\YounghaX{#1}{#2}{#3}{#4}{#5}{#6}{#7}{}}
\newcommand{\Younghg}      [8]  {\YounghaX{#1}{#2}{#3}{#4}{#5}{#6}{#7}{#8}{}}
```

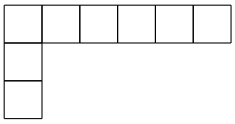
Examples



```
\Younghb{5cm}{3}{3}
```



```
\Younghb{5cm}{4}{2}
```



```
\Younghc{5cm}{6}{1}{1}
```

4.2.2 Young Tableaux with a vertical form

For a Young Tableaux having generally a vertical form, or, in other words, $n_x < n_y$, e.g. the second one of the four examples above, it is better to draw it column-by-column with the following `\newcommand`s:

Definitions

```
\newcommand{\YoungvaX}     [3]  {\Young{#1}{(1,#2)
                                   \mvpbox{1}{#2}{#2}
                                   #3}}
```

```
\newcommand{\YoungvbX}     [4]  {\Young{#1}{(2,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   #4}}
```

```
\newcommand{\YoungvcX}     [5]  {\Young{#1}{(3,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   \mvpbox{3}{#2}{#4}
                                   #5}}
```

```
\newcommand{\YoungvdX}     [6]  {\Young{#1}{(4,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   \mvpbox{3}{#2}{#4}
                                   \mvpbox{4}{#2}{#5}
                                   #6}}
```

```
\newcommand{\YoungveX}     [7]  {\Young{#1}{(5,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   \mvpbox{3}{#2}{#4}
                                   \mvpbox{4}{#2}{#5}
                                   \mvpbox{5}{#2}{#6}
                                   #7}}
```

```
\newcommand{\YoungvfX}     [8]  {\Young{#1}{(6,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   \mvpbox{3}{#2}{#4}
                                   \mvpbox{4}{#2}{#5}
                                   \mvpbox{5}{#2}{#6}
                                   \mvpbox{6}{#2}{#7}
                                   #8}}
```

```
\newcommand{\YoungvgX}     [9]  {\Young{#1}{(7,#2)
                                   \mvpbox{1}{#2}{#2}
                                   \mvpbox{2}{#2}{#3}
                                   \mvpbox{3}{#2}{#4}
                                   \mvpbox{4}{#2}{#5}
                                   \mvpbox{5}{#2}{#6}
                                   \mvpbox{6}{#2}{#7}
                                   \mvpbox{7}{#2}{#8}
                                   #9}}
```

```
\newcommand{\mvpbox}       [3]  {{\multiput(#1,#2)(0,-1){#3}{\usebox{\Youngbox}}}
```

Here the argument #1 for commands `\YoungvaX`, `\YoungvbX`, ..., `\YoungvgX`, is the *width* (not the height!) of the place where you put your boxes and have to be given with its unit, the "v" means that the general form of these boxes is vertical. Note here that, for the Young Tableaux having a square form, namely, $n_x = n_y$, e.g. the last two examples above, you can use either the `\YounghxX` family or the `\YoungvxX` family. Then the last three examples above can be rewritten as

Examples

```
\YoungvbX{2  cm}{3}{1}   {                          \Younglabel{(2,3)}{$x$}}
```

```
\YoungvbX{2  cm}{2}{2}   {                          \Younglabel{(2,2)}{ c }
                          \Younglabel{(1,1)}{ a } \Younglabel{(2,1)}{ b }}
```

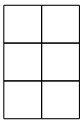
```
\YoungvcX{2.5cm}{3}{2}{1}{\Younglabel{(3,3)}{$c$}
                          \Younglabel{(2,2)}{$b$}
                          \Younglabel{(1,1)}{$a$}}
```

Similar to the `\Younghx` family, if you don't want to label any box, you can use the following `\newcommand`s:

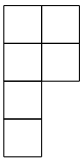
Definitions

```
\newcommand{\Youngva}      [2]  {\YoungvaX{#1}{#2}{}}
\newcommand{\Youngvb}      [3]  {\YoungvaX{#1}{#2}{#3}{}}
\newcommand{\Youngvc}      [4]  {\YoungvaX{#1}{#2}{#3}{#4}{}}
\newcommand{\Youngvd}      [5]  {\YoungvaX{#1}{#2}{#3}{#4}{#5}{}}
\newcommand{\Youngve}      [6]  {\YoungvaX{#1}{#2}{#3}{#4}{#5}{#6}{}}
\newcommand{\Youngvf}      [7]  {\YoungvaX{#1}{#2}{#3}{#4}{#5}{#6}{#7}{}}
\newcommand{\Youngvg}      [8]  {\YoungvaX{#1}{#2}{#3}{#4}{#5}{#6}{#7}{#8}{}}
```

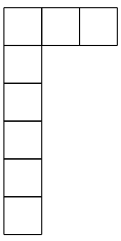
Examples



```
\Youngvb{5cm}{3}{3}
```



```
\Youngvb{5cm}{4}{2}
```



```
\Youngvc{5cm}{6}{1}{1}
```

Chapter 5

Tables

All of the `\newcommand`s introduced in this section *have not been defined* in my packages. Because there could be many (actually too many) variations of the commands with tiny differences. Hence, I personally prefer to define some of them in the preamble of a new created file when I really need them, and perhaps rewrite the definitions for more suitable functions.

5.1 `\multicolumn` command

Definitions

```
\newcommand{\bc}          [1]  {\multicolumn{2}{| c |}{#1}}
\newcommand{\bcl}         [1]  {\multicolumn{2}{| c  }{#1}}
\newcommand{\bcr}         [1]  {\multicolumn{2}{  c |}{#1}}
```

```
\newcommand{\bl}          [1]  {\multicolumn{2}{| l |}{#1}}
\newcommand{\bll}         [1]  {\multicolumn{2}{| l  }{#1}}
\newcommand{\blr}         [1]  {\multicolumn{2}{  l |}{#1}}
```

```
\newcommand{\br}          [1]  {\multicolumn{2}{| r |}{#1}}
\newcommand{\brl}         [1]  {\multicolumn{2}{| r  }{#1}}
\newcommand{\brr}         [1]  {\multicolumn{2}{  r |}{#1}}
```

The first letter in the commands above, "b", denotes that we want to combine "two" columns (`\multicolumn{2}`), the second letter "c", "l", or "r" describes the position of the element ("center", "left" or "right"), the third letter "l" or "r" indicates that there is *only one* vertical line on the "left" or "right" side of this element. If there are two lines on the both side of the element, then we treat this choice as default and write nothing. According to this method, we can build lots of the other `\newcommand`s, for example,

Definitions

```
\newcommand{\ac}          [1]  {\multicolumn{1}{| c |}{#1}}
\newcommand{\acl}         [1]  {\multicolumn{1}{| c  }{#1}}
\newcommand{\acr}         [1]  {\multicolumn{1}{  c |}{#1}}
```

```
\newcommand{\cc}          [1]  {\multicolumn{3}{| c |}{#1}}
\newcommand{\ccl}         [1]  {\multicolumn{3}{| c  }{#1}}
\newcommand{\ccr}         [1]  {\multicolumn{3}{  c |}{#1}}
```

or, even two lines on each side of the element:

Definitions

```
\newcommand{\dc}          [1]  {\multicolumn{4}{|| c ||}{#1}}
\newcommand{\dcl}         [1]  {\multicolumn{4}{|| c   }{#1}}
\newcommand{\dcr}         [1]  {\multicolumn{4}{   c ||}{#1}}
```

```
\newcommand{\ec}          [1]  {\multicolumn{5}{|  c  |}{#1}}
\newcommand{\ecl}         [1]  {\multicolumn{5}{|| c   }{#1}}
\newcommand{\ecr}         [1]  {\multicolumn{5}{   c ||}{#1}}
```

On the other hand, sometimes we want not only to combine more columns but also to use the same element. For such cases, we can simply extend the above system to the following one with a "T" (stands for "text"):

Definitions

```
\newcommand{\bcT}             {\multicolumn{2}{| c |}{......}}
\newcommand{\bclT}            {\multicolumn{2}{| c  }{......}}
\newcommand{\bcrT}            {\multicolumn{2}{  c |}{......}}
```

```
\newcommand{\blT}             {\multicolumn{2}{| l |}{......}}
\newcommand{\bllT}            {\multicolumn{2}{| l  }{......}}
\newcommand{\blrT}            {\multicolumn{2}{  l |}{......}}
```

```
\newcommand{\brT}             {\multicolumn{2}{| r |}{......}}
\newcommand{\brlT}            {\multicolumn{2}{| r  }{......}}
\newcommand{\brrT}            {\multicolumn{2}{  r |}{......}}
```

where the "....." denotes the fixed text which need to be used more times.

5.2 `\makebox` command

Definitions

```
\newcommand{\mbxc}        [2]  {\makebox[#1 cm][c]{#2}}
\newcommand{\mbxl}        [2]  {\makebox[#1 cm][l]{#2}}
\newcommand{\mbxr}        [2]  {\makebox[#1 cm][r]{#2}}
```

Here I used "mbx" as an abbreviation for "makebox" and also "c", "l", and "r" to indicate the position of the element. Moreover, similar to what I did with the `\multicolumn` command, we can define `\newcommand`s with a fixed element or with a fixed width of the box:

Definitions

```
\newcommand{\mbxcT}       [1]  {\makebox[#1 cm][c]{......}}
\newcommand{\mbxlT}       [1]  {\makebox[#1 cm][l]{......}}
\newcommand{\mbxrT}       [1]  {\makebox[#1 cm][r]{......}}
```

```
\newcommand{\mbxcW}       [1]  {\makebox[...cm][c]{#1}}
\newcommand{\mbxlW}       [1]  {\makebox[...cm][l]{#1}}
\newcommand{\mbxrW}       [1]  {\makebox[...cm][r]{#1}}
```

or, even both of them:

Definitions

```
\newcommand{\mbxcWT}          {\makebox[...cm][c]{......}}
\newcommand{\mbxlWT}          {\makebox[...cm][l]{......}}
\newcommand{\mbxrWT}          {\makebox[...cm][r]{......}}
```

where the "W" stands for the fixed "width" of the box.

Chapter 6

Beamer Class

I defined some `\newcommand`s specially for the `beamer` class in my `clshan-beamer` package. Please note here, you *must* use the `clshan-math` package before using the `clshan-beamer` package.

6.1 `equation` and `eqnarray` environments

For a presentation, we usually show equations without equation numbers. This means that we only need the `\[ \]` and the `eqnarray*` environments. Meanwhile, equations in the `\normalsize` are for me too large to use (on one slide I can give too less equations and information as I hope). Hence, I defined now and just for the `beamer` class the `\newcommand`s which I suggested you in section 1.3, the `\eqin` and the `\eqnin` with the `\footnotesize`:

Definitions

```
\newcommand{\eqin}      [1]  {{\footnotesize \[                #1 \]             }}
\newcommand{\eqnin}     [1]  {{\footnotesize \begin{eqnarray*} #1 \end{eqnarray*}}}
```

Note that I used here the `\eqin` for the "`\[ \]`" (not the `equation`) environment and the `\eqnin` for the "`eqnarray*`" (not the `eqnarray`) environment. Because I don't want to use the `equation` and the `eqnarray` environments for my presentations. Moreover, I also defined `\newcommand`s with the `\scriptsize` and the `\tiny`:

Definitions

```
\newcommand{\eqsin}     [1]  {{\scriptsize   \[                #1 \]             }}
\newcommand{\eqnsin}    [1]  {{\scriptsize   \begin{eqnarray*} #1 \end{eqnarray*}}}
```

```
\newcommand{\eqxin}     [1]  {{\tiny         \[                #1 \]             }}
\newcommand{\eqnxin}    [1]  {{\tiny         \begin{eqnarray*} #1 \end{eqnarray*}}}
```

Here I used the letter "s" and "x" to indicate "smaller" and "extreme small" (not the `\small`, but just compare with the `\footnotesize`). Furthermore, it seems to be better to define `\newcommand`s for the cases in which I need to *enlarge* the size of my equations, although they would be used very very seldom.

Definitions

```
\newcommand{\eqlin}     [1]  {{\small        \[                #1 \]             }}
\newcommand{\eqnlin}    [1]  {{\small        \begin{eqnarray*} #1 \end{eqnarray*}}}
```

where I used "l" to indicate "larger" (not the `\large`, but just compare with the `\footnotesize`). On the other hand, because I set the `\footnotesize` as the usual size for my equations on the slides, I need to correct (redefine) the space on the both side of an "=" sign in the `eqnarray*` environment (This is why you must use the `clshan-math` package at first and then `clshan-beamer` package.):

Definitions

```
\renewcommand{\&}              {&\hspace{-2.25ex}}

\renewcommand{\=}              {&\hspace{-2.25ex} = &\hspace{-2.25ex}}
```

Note that if you set one another size as your usual size for the equations on the slides, *perhaps* you have to correct *my corrections*. Finally, when I putted an equation directly under a title such like

- Rate equation of the WIMP-nucleus elastic scattering:

$$\frac{dR}{dQ} = \mathcal{A}F^2(Q)\int_{v_{\min}}^{\infty}\left[\frac{f_1(v)}{v}\right]dv$$

Because the height of this equation is higher than that of a normal text, this equation will push the title upwards. This means that this title will be higher than the other one on the previous or the next slide. When I go through these pages, the bullet will be seen a small shift first upwards and then downwards. I don't like this shift. My solution for this shift-problem is: insert one line with just one space `~` between the title and the equation, then shift this equation upwards. For this solution I defined the following `\newcommand`:

Definitions

```
\newcommand{\eqdown}       [1]  {\\ ~ \vspace{#1cm}}
```

Note that you have to give a *minus* distance as the argument for this command to pull the equation *upwards*, although I used the word "down". Because the total effect of the command is to *push* the equation *downwards* in order to let the title not be pushed upwards.

Example

```
\eqdown{-0.3}
```

6.2 Redefining the `\newcommand`s for the `eqnarray` environment in Section 1.3

Like what I did for the `\&` and the `\=` commands in Section 6.1, I have to readjust the width of the space on both sides of each binary relation defined in Section 1.3 for using the `beamer` class, so that you can copy the formulae directly from your papers or notes and paste them in the `beamer` files without changing anything. But, let me remind you again, you must use the `clshan-math` package before using the `clshan-beamer` package!

Definitions

```
\renewcommand{\eqnneq}         {& \hspace{-2.25ex} \neq    & \hspace{-2.25ex}}

\renewcommand{\eqnne}          {& \hspace{-2.25ex} \ne     & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnleq}         {& \hspace{-2.25ex} \leq    & \hspace{-2.25ex}}

\renewcommand{\eqnle}          {& \hspace{-2.25ex} \le     & \hspace{-2.25ex}}
```

```
\renewcommand{\eqngeq}          {& \hspace{-2.25ex} \geq    & \hspace{-2.25ex}}
\renewcommand{\eqnge}           {& \hspace{-2.25ex} \ge     & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnll}           {& \hspace{-2.25ex} \ll     & \hspace{-2.25ex}}
\renewcommand{\eqngg}           {& \hspace{-2.25ex} \gg     & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnequiv}        {& \hspace{-2.25ex} \equiv  & \hspace{-2.25ex}}
\renewcommand{\eqndoteq}        {& \hspace{-2.25ex} \doteq  & \hspace{-2.25ex}}
```

```
\renewcommand{\eqncong}         {& \hspace{-2.25ex} \cong   & \hspace{-2.25ex}}
\renewcommand{\eqnapprox}       {& \hspace{-2.25ex} \approx & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnsimeq}        {& \hspace{-2.25ex} \simeq  & \hspace{-2.25ex}}
\renewcommand{\eqnsim}          {& \hspace{-2.25ex} \sim    & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnpropto}       {& \hspace{-2.25ex} \propto & \hspace{-2.25ex}}
```

```
\renewcommand{\conti}           {& \hspace{-2.25ex} ~       & \hspace{-2.25ex}}
```

```
\renewcommand{\eqnBinary} [1]   {& \hspace{-2.25ex} #1      & \hspace{-2.25ex}}
```

6.3 `column` environment

I have to use the `columnsonlytextwidth` environment to put two or three pictures on the same row for my talks. It seems to be convenient to define some `\newcommand`s for the `column` environment with `center`, `flushleft`, or `flushright` environment first.

Definitions

```
\newcommand{\columncenter}     [2]  {\begin{column}{#1 cm}
                                      \begin{center}
                                       #2
                                      \end{center}
                                      \end{column}}
```

```
\newcommand{\columnleft}       [2]  {\begin{column}{#1 cm}
                                      \begin{flushleft}
                                       #2
                                      \end{flushleft}
                                      \end{column}}
```

```
\newcommand{\columnright}      [2]  {\begin{column}{#1 cm}
                                     \begin{flushright}
                                      #2
                                     \end{flushright}
                                     \end{column}}
```

In the next sections you will find some examples of these three commands. I will use them directly in order to reduce my definitions of the other `\newcommand`s. Usually, I defined the `\newcommand`s with only the original LaTeX commands, then I'm sure that I (and anybody else) can just copy some of them to the preamble of a new document without including the whole `clshan-math` package. But for the commands defined in the next sections, it is in fact better to use some of my defined commands directly.

6.4 Frames for inserting pictures

There are two reasons to let me use a frame instead of a picture when I prepare my talk. First, my notebook is six one-half years old and seems to be tired to work with pictures. Second, sometimes I know I will give a picture at this place but in this moment I don't have this picture. Hence, It is useful to define some `\newcommand`s to simply draw some frames to reserve the places in which I will put pictures.

Definition

```
\newcommand{\picframe}         [3]  {\setlength{\unitlength}{1cm}
                                     \begin{picture}(#1,#2)
                                     \put( 0, 0){\line(1,0){#1}}
                                     \put( 0, 0){\line(0,1){#2}}
                                     \put( 0,#2){\line(1,0){#1}}
                                     \put(#1, 0){\line(0,1){#2}}
                                     \put( 0, 0){\makebox(#1,#2){#3}}
                                     \end{picture}}
```

Note here that, first, I will also use this `\picframe` as a basic command for defining the other `\newcommand`s later. Second, I set the unit length of drawing the picture frame to be 1 cm in order to combine the `\picframe` command suitable with my `\columncenter`, `\columnleft`, and `\columnright` commands defined in the last section, and, hence, all arguments of the `\newcommand`s defined here and in the rest of this chapter for widths and heights must be given *in unit of "cm"* and the unit, cm, must be neglected. Third, for each `\newcommand` defined here and in the rest of this chapter, I will give you a list of its arguments and an example to let you know how to use these commands without understanding the definitions of these `\newcommand`s.

Arguments

#1: width of this frame.
#2: height of this frame.
#3: a name to remain you which picture should be here.
Lengths must be given in unit of cm, but without the unit.

Note that I *didn't* define this command in the `center` environment, because I have to reserve this degree of freedom to combine this command with the `flushleft` or the `flushright` environment. (You can find the advantage of the reservation of this degree of freedom later.) So with this command you can just get a frame in perhaps left side of one slide. If you want to put this frame in the center of the text, you need to `\begin` the `center` environment.

Example

```
\begin{center}
\picframe{4}{3}{dRdQ}
\end{center}
```

If you want to put two pictures in one row, you must consider about whether these two pictures have the same width. If two frames have (more or less) the same width, you can use this `\newcommand`:

Definition

```
\newcommand{\picdframe}        [6]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\picframe{#3}{#4}{#5}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#2}{\picframe{#3}{#4}{#6}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Here the arguments have been defined as

Arguments

#1: space width between these two frames.
#2: common column width.
#3: common width of the two frames.
#4: common height of the two frames.
#5: name of the left frame.
#6: name of the right frame.
$\#1 + \#2 \times 2$ = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Note here that the sum of the widths of the two columns and the space between them (i.e., $\#1 + \#2 \times 2$) *must be* equal to the *width of the text*. (The default of the text width is 10.8 cm.) For the case in which two frames have different widths, I defined a `\newcommand` with 9 arguments (*sorry!*):

Definition

```
\newcommand{\picDframe}        [9]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\picframe{#4}{#5}{#6}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#3}{\picframe{#7}{#8}{#9}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Here the arguments have been defined as

Arguments

#1: space width between these two frames.
#2: width of the left column.
#3: width of the right column.
#4: width of the left frame.
#5: height of the left frame.
#6: name of the left frame.
#7: width of the right frame.
#8: height of the right frame.
#9: name of the right frame.
#1 + #2 + #3 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Here the small "d" and capital "D" denote "double" and I will always use a small letter for columns with equal width and a capital letter for columns with different width.

Examples

```
\picdframe{0.8}{5}    {4.5}{3}{DAMA-4yrs}           {DAMA-7yrs}

\picDframe{0.8}{6}{4} {5.5}{3}{DAMA-4yrs} {3.5}{2.5}{DAMA-7yrs}
```

I also defined a command for the case of three frames which have the same width:

Definition

```
\newcommand{\pictframe}        [7]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\picframe{#3}{#4}{#5}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columncenter{#2}{\picframe{#3}{#4}{#6}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#2}{\picframe{#3}{#4}{#7}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor frames.
#2: common column width.
#3: common width of the three frames.
#4: common height of the three frames.
#5: name of the left frame.
#6: name of the middle frame.
#7: name of the right frame.
#1 × 2 + #2 × 3 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

For the case of three frames which have different widths, I have

Definition

```
\newcommand{\picTframe}        [7]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\picframe #5}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columncenter{#3}{\picframe #6}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#4}{\picframe #7}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor frames.
#2: width of the left column.
#3: width of the middle column.
#4: width of the right column.
#5: width, height, and name of the left frame.
#6: width, height, and name of the middle frame.
#7: width, height, and name of the right frame.
#1 × 2 + #2 + #3 + #4 = text width (default: 10.8 cm, my personal: 11.8 cm).
#5, #6, #7: {width} {height} {name}.
Lengths must be given in unit of cm, but without the unit.

Here the small "t" and capital "T" denote "triple" and the small and the capital letter are for columns with equal or different width, respectively. Note that because the number of arguments for one `\newcommand` can be maximum 9, the last three arguments must be written as such form: {width}{height}{name}.

Examples

```
\pictframe{0.6}{3.2}        {3}{3}{Coma}         {Hydra}           {Perseus}

\picTframe{0.3}{3}{3}{4.2} {{3}{3}{Coma}} {{3}{3}{Hydra}} {{3.8}{3}{Perseus}}
```

6.5 Inserting pictures with the \pgfuseimage command

First, I gave an other name for the command \pgfuseimage in order to let the commands for this system easily to remember.

Definition

```
\newcommand{\imagein}          [1]  {\pgfuseimage{#1}}
```

Example

```
\imagein{dRdQ}
```

Now, similar to what I did in the last section, I considered the cases of two or three images which have the same or different widths, respectively. Actually, what I had to do is just change the command \picframe to \pgfuseimage. Two images with the same width:

Definition

```
\newcommand{\imagedin}         [4]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\pgfuseimage{#3}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#2}{\pgfuseimage{#4}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two images.
#2: common column width.
#3: name of the left image.
#4: name of the right image.
#1 + #2 × 2 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Two images have different widths:

Definition

```
\newcommand{\imageDin}         [5]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\pgfuseimage{#4}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#3}{\pgfuseimage{#5}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two images.
#2: width of the left column.
#3: width of the right column.
#4: name of the left image.
#5: name of the right image.
#1 + #2 + #3 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Examples

```
\imagedin{0.8}{5}    {DAMA-4yrs} {DAMA-7yrs}

\imageDin{0.8}{6}{4} {DAMA-4yrs} {DAMA-7yrs}
```

Three images have the same width:

Definition

```
\newcommand{\imagetin}         [5]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\pgfuseimage{#3}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columncenter{#2}{\pgfuseimage{#4}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#2}{\pgfuseimage{#5}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor images.
#2: common column width.
#3: name of the left image.
#4: name of the middle image.
#5: name of the right image.
#1 × 2 + #2 × 3 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Three images have different widths:

Definition

```
\newcommand{\imageTin}         [7]  {\vspace{0.3cm}
                                     \begin{columnsonlytextwidth}
                                     \columnright {#2}{\pgfuseimage{#5}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columncenter{#3}{\pgfuseimage{#6}}
                                     \columncenter{#1}{~}
                                     \hspace{-0.6cm}
                                     \columnleft  {#4}{\pgfuseimage{#7}}
                                     \end{columnsonlytextwidth}
                                     \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor images.
#2: width of the left column.
#3: width of the middle column.
#4: width of the right column.
#5: name of the left image.
#6: name of the middle image.
#7: name of the right image.
$\#1 \times 2 + \#2 + \#3 + \#4$ = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Examples

```
\imagetin{0.6}{3.2}       {Coma} {Hydra} {Perseus}

\imageTin{0.3}{3}{3}{4.2} {Coma} {Hydra} {Perseus}
```

6.6 Inserting pictures with the `\includegraphics` command

In order to complete my whole system of inserting pictures on a slide, I defined also `\newcommand`s using the `\includegraphics` command. Actually, I just changed the command `\pgfuseimage` to `\includegraphics`. The whole structure of the two-columns and three-columns (in fact three and five) systems are perfect, right?

Definition

```
\newcommand{\epsin}            [2]  {\includegraphics[scale=#1]{#2.eps}}
```

Example

```
\epsin{0.25}{dRdQ}
```

Two eps-images have the same width:

Definition

```
\newcommand{\epsdin}          [5]  {\vspace{0.3cm}
                                    \begin{columnsonlytextwidth}
                                    \columnright {#2}{\includegraphics[scale=#3]{#4.eps}}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columnleft  {#2}{\includegraphics[scale=#3]{#5.eps}}
                                    \end{columnsonlytextwidth}
                                    \vspace{0.1cm}}
```

Arguments

#1: space width between two eps-images.
#2: common column width.
#3: common scale for these two eps-images.
#4: name of the left eps-image.
#5: name of the right eps-image.
#1 + #2 × 2 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Two eps-images have different widths:

Definition

```
\newcommand{\epsDin}          [7]  {\vspace{0.3cm}
                                    \begin{columnsonlytextwidth}
                                    \columnright {#2}{\includegraphics[scale=#4]{#5.eps}}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columnleft  {#3}{\includegraphics[scale=#6]{#7.eps}}
                                    \end{columnsonlytextwidth}
                                    \vspace{0.1cm}}
```

Arguments

#1: space width between two eps-images.
#2: width of the left column.
#3: width of the right column.
#4: scale for the left eps-image.
#5: name of the left eps-image.
#6: scale for the right eps-image.
#7: name of the right eps-image.
#1 + #2 + #3 = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Examples

```
\espdin{0.8}{5}    {0.3}{DAMA-4yrs}       {DAMA-7yrs}

\epsDin{0.8}{6}{4} {0.3}{DAMA-4yrs} {0.35}{DAMA-7yrs}
```

Three eps-images have the same width:

Definition

```
\newcommand{\epstin}          [6]  {\vspace{0.3cm}
                                    \begin{columnsonlytextwidth}
                                    \columnright {#2}{\includegraphics[scale=#3]{#4.eps}}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columncenter{#2}{\includegraphics[scale=#3]{#5.eps}}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columnleft  {#2}{\includegraphics[scale=#3]{#6.eps}}
                                    \end{columnsonlytextwidth}
                                    \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor eps-images.
#2: common column width.
#3: common scale for three eps-images.
#4: name of the left eps-image.
#5: name of the middle eps-image.
#6: name of the right eps-image.
$\#1 \times 2 + \#2 \times 3$ = text width (default: 10.8 cm, my personal: 11.8 cm).
Lengths must be given in unit of cm, but without the unit.

Three eps-images have different widths:

Definition

```
\newcommand{\epsTin}          [7]  {\vspace{0.3cm}
                                    \begin{columnsonlytextwidth}
                                    \columnright {#2}{\includegraphics #5}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columncenter{#3}{\includegraphics #6}
                                    \columncenter{#1}{~}
                                    \hspace{-0.6cm}
                                    \columnleft  {#4}{\includegraphics #7}
                                    \end{columnsonlytextwidth}
                                    \vspace{0.1cm}}
```

Arguments

#1: space width between two neighbor eps-images.
#2: width of the left column.
#3: width of the middle column.
#4: width of the right column.
#5: scale for and name of the left eps-image.
#6: scale for and name of the middle eps-image.
#7: scale for and name of the right eps-image.
#1 × 2 + #2 + #3 + #4 = text width (default: 10.8 cm, my personal: 11.8 cm).
#5, #6, #7: [scale=..]{xxx.eps}.
Lengths must be given in unit of cm, but without the unit.

Note that because the number of arguments for one `\newcommand` can be maximum 9, the last three arguments must be written as such form: [scale=..]{xxx.eps}.

Examples

```
\epstin{0.6}{3.2}              {0.2}{Coma}                  {Hydra}                  {Perseus}

\epsTin{0.3}{3}{3}{4.2} {[scale=0.2]{Coma.eps}} {[scale=0.3]{Hydra.eps}} {[scale=0.2]{Perseus.eps}}
```

6.7 Using of the pdflatex command

When I used the `\pdflatex` command to typeset my files, I found a problem: although I used the `center` or the `flushright` environment, I always saw the pictures on the left of the column. The solution of this problem: use the `\hspace` command to fix the position of each picture. For a frame of picture, I defined these three `\newcommand`s for one, or two, or even three pictures on one row:

Definitions

```
\newcommand{\pdflatexpicframea}   [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.38cm}
                                        \picframe{#2}{#3}{#4}
                                        \end{minipage}}
```

```
\newcommand{\pdflatexpicframeb}   [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.77cm}
                                        \picframe{#2}{#3}{#4}
                                        \end{minipage}}
```

```
\newcommand{\pdflatexpicframec}   [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-1.28cm}
                                        \picframe{#2}{#3}{#4}
                                        \end{minipage}}
```

Arguments

#1: shift distance of this frame.
#2: width of the frame.
#3: height of the frame.
#4: name of the frame.
Lengths must be given in unit of cm, but without the unit.

Example

```
\pdflatexpicframea{3.4}{4}{3}{dRdQ}
```

(Compare with the example of `\picframe`.) Note that if you just want to insert one picture, you can use this `\pdflatexpicframea` command. But, if you want to insert two pictures, you need to use the `\pdflatexpicframea` and `\pdflatexpicframeb` commands. (See the example for the `\pgfuseimage` command.) For three pictures, please combine the `\pdflatexpicframea`, the `\pdflatexpicframeb`, and `\pdflatexpicframec` commands. (See the example for the `\includegraphics` command.) For the `\pgfuseimage` command:

Definitions

```
\newcommand{\pdflateximageain}    [3]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.38cm}
                                        \pgfuseimage{#3}
                                        \end{minipage}}
```

```
\newcommand{\pdflateximagebin}    [3]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.77cm}
                                        \pgfuseimage{#3}
                                        \end{minipage}}
```

```
\newcommand{\pdflateximagecin}    [3]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-1.28cm}
                                        \pgfuseimage{#3}
                                        \end{minipage}}
```

Arguments

#1: shift distance of this frame.
#2: width of the image.
#3: name of the image.
Lengths must be given in unit of cm, but without the unit.

Example

```
\pdflateximageain{0.5}{5.5}{DAMA-4yrs}

\pdflateximagebin{0.8}{3.5}{DAMA-7yrs}
```

(Compare with the example of \picDframe.) Note that if you want to insert only one picture, you just need to use the \pdflateximageain command. (See the example for the \picframe command.) For three pictures, please combine the \pdflateximageain, the \pdflateximagebin, and \pdflateximagecin commands. (See the example for the \includegraphics command.) For the \includegraphics command:

Definitions

```
\newcommand{\pdflatexepsain}      [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.38cm}
                                        \includegraphics[scale=#3]{#4.eps}
                                        \end{minipage}}
```

```
\newcommand{\pdflatexepsbin}      [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-0.77cm}
                                        \includegraphics[scale=#3]{#4.eps}
                                        \end{minipage}}
```

```
\newcommand{\pdflatexepsecin}     [4]  {\hspace{#1 cm}
                                        \begin{minipage}{#2 cm}
                                        \hspace{-1.28cm}
                                        \includegraphics[scale=#3]{#4.eps}
                                        \end{minipage}}
```

Arguments

#1: shift distance of this frame.
#2: width of the eps-image.
#3: scale for the eps-image.
#4: name of the eps-image.
Lengths must be given in unit of cm, but without the unit.

Example

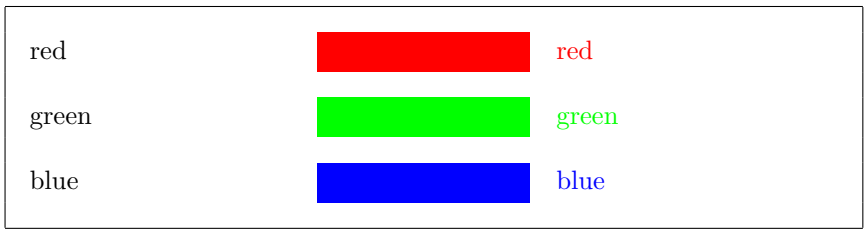
```
\pdflatexepseain{0  }{3  }{3}{Coma   }

\pdflatexepsebin{0.3}{3  }{3}{Hydra  }

\pdflatexepsecin{0.3}{3.8}{3}{Perseus}
```

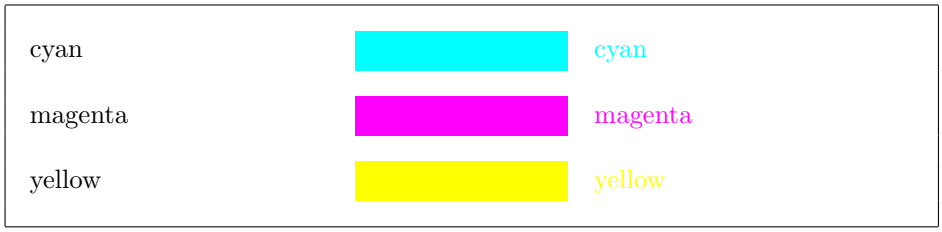
(Compare with the example of \picTframe.) Note that if you want to insert one eps-image, you just need to use the \pdflatexepsain command, (See the example for the \picframe command.) For two eps-images, you need the \pdflatexepsain and the \pdflatexepsbin commands. (See the example for the \pgfuseimage command.)

Chapter 7

Colors

In LaTeX we have the following basic colors:





It should be enough for writing scientific papers or even books. But for writing transparencies and slides there could be two problems: first, the "green" above is too bright (at least for me); second, "7" different colors (excluding "white") may be for some people too less. Hence since long time ago I tried to define some new colors. But it is pretty difficult for me to find suitable combinations of the red, green, and blue colors (namely, the `rgb` system).

Fortunately, wenn I learned the HTML language for building my own web site, I found a list of 147 different color names with a hexadecimal notation for the combination of red, green, and blue color values: `http://www.w3schools.com/html/html_colornames.asp`. Now I have the right combinations of the `rgb` system and I know what kind of colors these combinations will produce.

In the following section, I will give you my definitions of some often used colors and their hexadecimal values presented as $\#r_1r_2g_1g_2b_1b_2$, where the "$\#r_1r_2$" (from #00 to #FF, means from 0 to 255 in our usual decimal system) is the value of red light source and "$\#g_1g_2$" and "$\#b_1b_2$" are the values of "green" and "blue" light sources, respectively. What I had to do is just choosing a color, rewriting its value of red, green, or blue from the hexadecimal presentation to the decimal system, and then dividing *255* to obtain the suitable ratio from 0 to 1.

Please note that, first, before use my `clshan-color` package you have to use the `color` package: `\usepackage{color,clshan-color}`; second, all color names and `\newcommand`s defined in my `clshan-color` package begin with a *lowercase* letter.

7.1 Definitions of some often used colors

7.1.1 Red series

I defined the following *17* colors for "red" series:

Definitions

```
\definecolor{red}                {rgb}{1   , 0   , 0   }     % #FF0000
\definecolor{brilliantred}       {rgb}{1   , 0.28, 0.28}     % #FF4848
\definecolor{darkred}            {rgb}{0.55, 0   , 0   }     % #8B0000
```

```
\definecolor{orange}             {rgb}{1   , 0.65, 0   }     % #FFA500
\definecolor{darkorange}         {rgb}{1   , 0.55, 0   }     % #FF8C00
\definecolor{orangered}          {rgb}{1   , 0.27, 0   }     % #FF4500
```

```
\definecolor{salmon}             {rgb}{0.98, 0.5 , 0.45}     % #FA8072
\definecolor{coral}              {rgb}{1   , 0.5 , 0.31}     % #FF7F50
\definecolor{tomato}             {rgb}{1   , 0.39, 0.28}     % #FF6347
```

```
\definecolor{palerose}           {rgb}{1   , 0.76, 0.88}     % #FFC2E0
\definecolor{pink}               {rgb}{1   , 0.75, 0.80}     % #FFC0CB
\definecolor{hotpink}            {rgb}{1   , 0.41, 0.71}     % #FF69B4
\definecolor{deeppink}           {rgb}{1   , 0.08, 0.58}     % #FF1493
\definecolor{crimson}            {rgb}{0.86, 0.08, 0.24}     % #DC143C
```

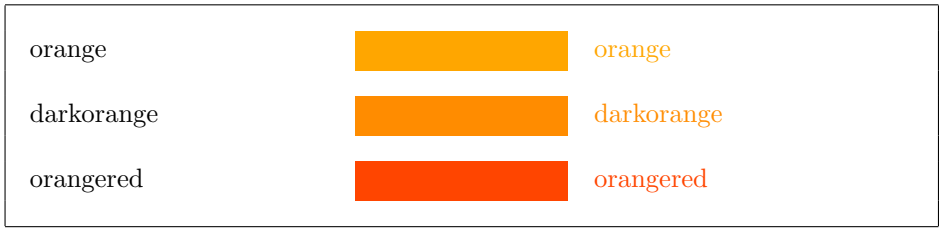
```
\definecolor{chocolate}          {rgb}{0.82, 0.41, 0.12}     % #D2691E
\definecolor{firebrick}          {rgb}{0.7 , 0.13, 0.13}     % #B22222
\definecolor{brown}              {rgb}{0.65, 0.16, 0.16}     % #A52A2A
```

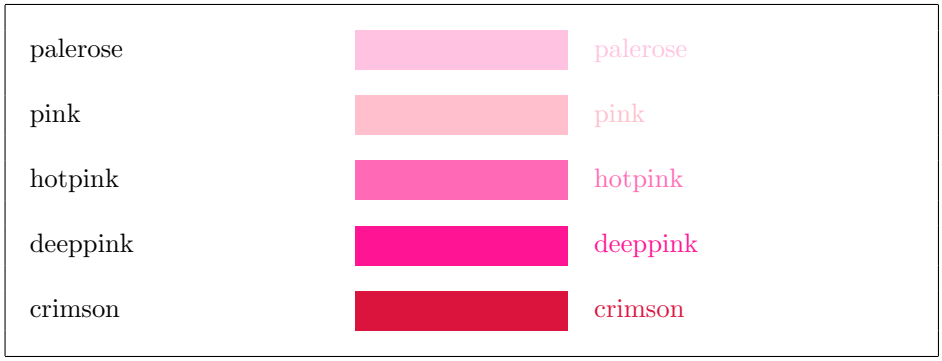
Examples

red red

brilliantred brilliantred

darkred darkred





7.1.2 Green series

I defined the following *13* colors for "green" series:

Definitions

```
\definecolor{green}          {rgb}{0   , 0.5 , 0   }     % #008000
\definecolor{darkgreen}      {rgb}{0   , 0.39, 0   }     % #006400
```

```
\definecolor{lime}           {rgb}{0   , 1   , 0   }     % #00FF00
\definecolor{limegreen}      {rgb}{0.2 , 0.8 , 0.2 }     % #32CD32
\definecolor{forestgreen}    {rgb}{0.13, 0.55, 0.13}     % #228B22
```

```
\definecolor{lightgreen}          {rgb}{0.56, 0.93, 0.56}     % #90EE90
\definecolor{springgreen}         {rgb}{0   , 1   , 0.5 }     % #00FF7F
```

```
\definecolor{palelimegreen}       {rgb}{0.92, 0.98, 0.74}     % #EBFABD
\definecolor{greenyellow}         {rgb}{0.68, 1   , 0.18}     % #ADFF2F
\definecolor{lawngreen}           {rgb}{0.49, 0.99, 0   }     % #7CFC00
```

```
\definecolor{brilliantspringbud}  {rgb}{0.57, 0.92, 0.04}     % #92EB0A
\definecolor{yellowgreen}         {rgb}{0.6 , 0.8 , 0.2 }     % #9ACD32
\definecolor{olive}               {rgb}{0.5 , 0.5 , 0   }     % #808000
```

Note that, I defined here "green" for the color "`{rgb}{0, 0.5, 0}`" and called the color "`{rgb}{0, 1, 0}`" "lime".

Examples

green green

darkgreen darkgreen

lime lime

limegreen limegreen

forestgreen forestgreen

lightgreen lightgreen

springgreen springgreen

palelimegreen palelimegreen

greenyellow greenyellow

lawngreen lawngreen

brilliantspringbud brilliantspringbud

yellowgreen yellowgreen

olive olive

7.1.3 Blue series

I defined the following *13* colors for "blue-cyan" series:

Definitions

```
\definecolor{blue}                {rgb}{0   , 0   , 1   }     % #0000FF
\definecolor{darkblue}            {rgb}{0   , 0   , 0.55}     % #00008B
```

```
\definecolor{cyan}                {rgb}{0   , 1   , 1   }     % #00FFFF
\definecolor{darkcyan}            {rgb}{0   , 0.55, 0.55}     % #008B8B
```

```
\definecolor{lightgrayishcyan}    {rgb}{0.75, 0.95, 0.95}     % #C0F2F2
\definecolor{lightgreyishcyan}    {rgb}{0.75, 0.95, 0.95}     % #C0F2F2
\definecolor{paleturquoise}       {rgb}{0.69, 0.93, 0.93}     % #AFEEEE
\definecolor{lightblue}           {rgb}{0.68, 0.85, 0.9 }     % #ADD8E6
\definecolor{skyblue}             {rgb}{0.53, 0.81, 0.92}     % #87CEEB
```

```
\definecolor{deepskyblue}         {rgb}{0   , 0.75, 1   }     % #00BFFF
\definecolor{dodgerblue}          {rgb}{0.12, 0.56, 1   }     % #1E90FF
\definecolor{royalblue}           {rgb}{0.25, 0.41, 0.88}     % #4169E1
\definecolor{slateblue}           {rgb}{0.42, 0.35, 0.8 }     % #6A5ACD
```

Examples

blue blue

darkblue darkblue

cyan cyan

darkcyan darkcyan

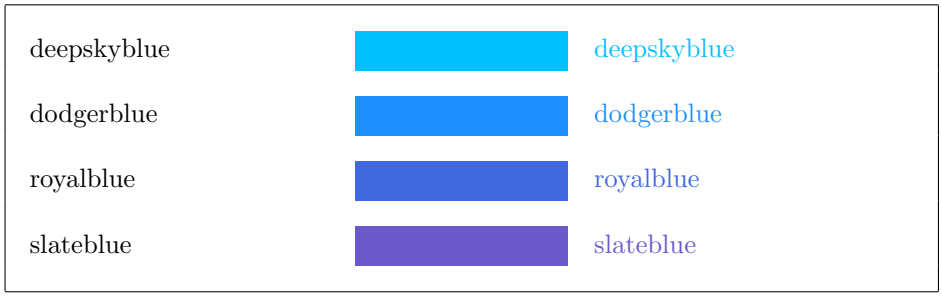
lightgrayishcyan lightgrayishcyan

lightgreyishcyan lightgreyishcyan

paleturquoise paleturquoise

lightblue lightblue

skyblue skyblue



7.1.4 Violet series

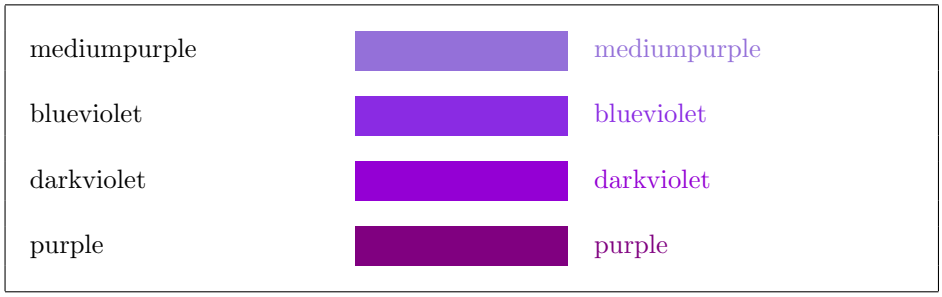
I defined the following *7* colors for "violet-magenta" series:

Definitions

```
\definecolor{plum}              {rgb}{0.87, 0.63, 0.87}     % #DDA0DD
\definecolor{violet}            {rgb}{0.93, 0.51, 0.93}     % #EE82EE
\definecolor{magenta}           {rgb}{1   , 0   , 1   }     % #FF00FF
```

```
\definecolor{mediumpurple}      {rgb}{0.58, 0.44, 0.85}     % #9370D8
\definecolor{blueviolet}        {rgb}{0.54, 0.17, 0.89}     % #8A2BE2
\definecolor{darkviolet}        {rgb}{0.58, 0   , 0.83}     % #9400D3
\definecolor{purple}            {rgb}{0.5 , 0   , 0.5 }     % #800080
```

Examples



7.1.5 Yellow series

I defined the following *5* colors for "yellow" series:

Definitions

```
\definecolor{verypaleyellow}      {rgb}{1   , 1   , 0.8 }     % #FFFFCC
\definecolor{yellow}              {rgb}{1   , 1   , 0   }     % #FFFF00
```

```
\definecolor{gold}                {rgb}{1   , 0.84, 0   }     % #FFD700
\definecolor{goldenrod}           {rgb}{0.85, 0.65, 0.13}     % #DAA520
\definecolor{darkgoldenrod}       {rgb}{0.72, 0.53, 0.04}     % #B8860B
```

Examples

verypaleyellow verypaleyellow

yellow yellow

gold gold

goldenrod goldenrod

darkgoldenrod darkgoldenrod

7.1.6 White-black series

Moreover, I also defined the following *10* colors for "white-black" series:

Definitions

```
\definecolor{white}               {rgb}{1   , 1   , 1   }     % #FFFFFF
\definecolor{gainsboro}           {rgb}{0.86, 0.86, 0.86}     % #DCDCDC
\definecolor{silver}              {rgb}{0.75, 0.75, 0.75}     % #C0C0C0
```

```
\definecolor{gray}                {rgb}{0.5 , 0.5 , 0.5 }     % #808080
\definecolor{grey}                {rgb}{0.5 , 0.5 , 0.5 }     % #808080
```

```
\definecolor{dimgray}             {rgb}{0.41, 0.41, 0.41}     % #696969
\definecolor{dimgrey}             {rgb}{0.41, 0.41, 0.41}     % #696969
```

```
\definecolor{darkgray}*           {rgb}{0.25, 0.25, 0.25}     % #404040
\definecolor{darkgrey}*           {rgb}{0.25, 0.25, 0.25}     % #404040
```

```
\definecolor{black}              {rgb}{0   , 0   , 0   }     % #000000
```

Note that, first, in order to let you remember these color names more easily and use them more comfortable, I defined both "gray" and "grey" here. Second, I used the name "darkgray" and "darkgrey" for the color "`{rgb}{0.25, 0.25, 0.25}`" instead of "`{rgb}{0.66, 0.66, 0.66}`" (hexadecimal value #A9A9A9) because the color "`{rgb}{0.66, 0.66, 0.66}`" is actually "brighter" than gray defined above.

Examples

white

gainsboro gainsboro

silver silver

gray gray

grey grey

dimgray dimgray

dimgrey dimgrey

darkgray darkgray

darkgrey darkgrey

black black

7.1.7 Non-white backgrounds

Finally, in order to give you some choices for a light, but non-white background, I defined the following *6* colors:

Definitions

```
\definecolor{cornsilk}           {rgb}{1   , 0.97, 0.86}     % #FFF8DC
\definecolor{navajowhite}        {rgb}{1   , 0.87, 0.68}     % #FFDEAD
\definecolor{wheat}              {rgb}{0.96, 0.87, 0.70}     % #F5DEB3
```

```
\definecolor{lightbrownishgray}    {rgb}{0.99, 0.89, 0.82}     % #FDE4D0
\definecolor{lightbrownishgrey}    {rgb}{0.99, 0.89, 0.82}     % #FDE4D0
\definecolor{peachpuff}            {rgb}{1   , 0.85, 0.73}     % #FFDAB9
```

Examples

cornsilk

navajowhite

wheat

lightbrownishgray

lightbrownishgrey

peachpuff

7.2 \newcommands for the command \textcolor with different colors

Mostly, we just need some different colors for the text on our transparencies or our slides in order to let our audience understand the context better. For the people so lazy like me, it seems to be a nice idea to define some \newcommands for the long command \textcolor{*color name*}.

7.2.1 Red series

Definitions

```
\newcommand{\red}                  {\textcolor{red}}
\newcommand{\brilliantred}         {\textcolor{darkred}}
\newcommand{\darkred}              {\textcolor{darkred}}
```

```
\newcommand{\orange}               {\textcolor{orange}}
\newcommand{\darkorange}           {\textcolor{darkorange}}
\newcommand{\orangered}            {\textcolor{orangered}}
```

```
\newcommand{\salmon}               {\textcolor{salmon}}
\newcommand{\coral}                {\textcolor{coral}}
\newcommand{\tomato}               {\textcolor{tomato}}
```

```
\newcommand{\palerose}          {\textcolor{palerose}}
\newcommand{\pink}              {\textcolor{pink}}
\newcommand{\hotpink}           {\textcolor{hotpink}}
\newcommand{\deeppink}          {\textcolor{deeppink}}
\newcommand{\crimson}           {\textcolor{crimson}}
```

```
\newcommand{\chocolate}         {\textcolor{chocolate}}
\newcommand{\firebrick}         {\textcolor{firebrick}}
\newcommand{\brown}             {\textcolor{brown}}
```

Examples

red	`\red{red}`
brilliantred	`\brilliantred{brilliantred}`
darkred	`\darkred{darkred}`

orange	`\orange{orange}`
darkorange	`\darkorange{darkorange}`
orangered	`\orangered{orangered}`

salmon	`\salmon{salmon}`
coral	`\coral{coral}`
tomato	`\tomato{tomato}`

palerose	`\palerose{palerose}`
pink	`\pink{pink}`
hotpink	`\hotpink{hotpink}`
deeppink	`\deeppink{deeppink}`
crimson	`\crimson{crimson}`

chocolate	`\chocolate{chocolate}`
firebrick	`\firebrick{firebrick}`
brown	`\brown{brown}`

7.2.2 Green series

Definitions

```
\newcommand{\green}                {\textcolor{green}}
\newcommand{\darkgreen}            {\textcolor{darkgreen}}
```

```
\newcommand{\lime}                 {\textcolor{lime}}
\newcommand{\limegreen}            {\textcolor{limegreen}}
\newcommand{\forestgreen}          {\textcolor{forestgreen}}
```

```
\newcommand{\lightgreen}           {\textcolor{lightgreen}}
\newcommand{\springgreen}          {\textcolor{springgreen}}
```

```
\newcommand{\palelimegreen}        {\textcolor{palelimegreen}}
\newcommand{\greenyellow}          {\textcolor{greenyellow}}
\newcommand{\lawngreen}            {\textcolor{lawngreen}}
```

```
\newcommand{\brilliantspringbud}   {\textcolor{brilliantspringbud}}
\newcommand{\yellowgreen}          {\textcolor{yellowgreen}}
\newcommand{\olive}                {\textcolor{olive}}
```

Examples

green	`\green{green}`
darkgreen	`\darkgreen{darkgreen}`

lime	`\lime{lime}`
limegreen	`\limegreen{limegreen}`
forestgreen	`\forestgreen{forestgreen}`

lightgreen	`\lightgreen{lightgreen}`
springgreen	`\springgreen{springgreen}`

palelimegreen	`\palelimegreen{palelimegreen}`
greenyellow	`\greenyellow{greenyellow}`
lawngreen	`\lawngreen{lawngreen}`

brilliantspringbud	\brilliantspringbud{brilliantspringbud}
yellowgreen	\yellowgreen{yellowgreen}
olive	\olive{olive}

7.2.3 Blue series

Definitions

```
\newcommand{\blue}                {\textcolor{blue}}
\newcommand{\darkblue}            {\textcolor{darkblue}}
```

```
\newcommand{\cyan}                {\textcolor{cyan}}
\newcommand{\darkcyan}            {\textcolor{darkcyan}}
```

```
\newcommand{\lightgrayishcyan}    {\textcolor{lightgrayishcyan}}
\newcommand{\lightgreyishcyan}    {\textcolor{lightgreyishcyan}}
\newcommand{\paleturquoise}       {\textcolor{paleturquoise}}
\newcommand{\lightblue}           {\textcolor{lightblue}}
\newcommand{\skyblue}             {\textcolor{skyblue}}
```

```
\newcommand{\deepskyblue}         {\textcolor{deepskyblue}}
\newcommand{\dodgerblue}          {\textcolor{dodgerblue}}
\newcommand{\royalblue}           {\textcolor{royalblue}}
\newcommand{\slateblue}           {\textcolor{slateblue}}
```

Examples

blue	\blue{blue}
darkblue	\darkblue{darkblue}

cyan	\cyan{cyan}
darkcyan	\darkcyan{darkcyan}

lightgrayishcyan	\lightgrayishcyan{lightgrayishcyan}
lightgreyishcyan	\lightgrayishcyan{lightgreyishcyan}
paleturquoise	\paleturquoise{paleturquoise}
lightblue	\lightblue{lightblue}
skyblue	\skyblue{skyblue}

deepskyblue	\deepskyblue{deepskyblue}
dodgerblue	\dodgerblue{dodgerblue}
royalblue	\royalblue{royalblue}
slateblue	\slateblue{slateblue}

7.2.4 Violet series

Definitions

\newcommand{\plum}	{\textcolor{plum}}
\newcommand{\violet}	{\textcolor{violet}}
\newcommand{\magenta}	{\textcolor{magenta}}

\newcommand{\mediumpurple}	{\textcolor{mediumpurple}}
\newcommand{\blueviolet}	{\textcolor{blueviolet}}
\newcommand{\darkviolet}	{\textcolor{darkviolet}}
\newcommand{\purple}	{\textcolor{purple}}

Examples

plum	\plum{plum}
violet	\violet{violet}
magenta	\magenta{magenta}

mediumpurple	\mediumpurple{mediumpurple}
blueviolet	\blueviolet{blueviolet}
darkviolet	\darkviolet{darkviolet}
purple	\purple{purple}

7.2.5 Yellow series

Definitions

```
\newcommand{\verypaleyellow}      {\textcolor{verypaleyellow}}
\newcommand{\yellow}              {\textcolor{yellow}}
```

```
\newcommand{\gold}                {\textcolor{gold}}
\newcommand{\goldenrod}           {\textcolor{goldenrod}}
\newcommand{\darkgoldenrod}       {\textcolor{darkgoldenrod}}
```

Examples

verypaleyellow `\verypaleyellow{verypaleyellow}`

yellow `\yellow{yellow}`

gold `\gold{gold}`

goldenrod `\goldenrod{goldenrod}`

darkgoldenrod `\darkgoldenrod{darkgoldenrod}`

7.2.6 White-black series

Definitions

```
\newcommand{\white}               {\textcolor{white}}
\newcommand{\gainsboro}           {\textcolor{gainsboro}}
\newcommand{\silver}              {\textcolor{silver}}
```

```
\newcommand{\gray}                {\textcolor{gray}}
\newcommand{\grey}                {\textcolor{grey}}
```

```
\newcommand{\dimgray}             {\textcolor{dimgray}}
\newcommand{\dimgrey}             {\textcolor{dimgrey}}
```

```
\newcommand{\darkgray}            {\textcolor{darkgray}}
\newcommand{\darkgrey}            {\textcolor{darkgrey}}
```

```
\newcommand{\black}                {\textcolor{black}}
```

Examples

	\white{white}
gainsboro	\gainsboro{gainsboro}
silver	\silver{silver}

gray	\gray{gray}
grey	\grey{grey}

dimgray	\dimgray{dimgray}
dimgrey	\dimgrey{dimgrey}

darkgray	\darkgray{darkgray}
darkgrey	\darkgrey{darkgrey}

black	\black{black}

7.2.7 Others

Definitions

```
\newcommand{\cornsilk}             {\textcolor{cornsilk}}
\newcommand{\navajowhite}          {\textcolor{navajowhite}}
\newcommand{\wheat}                {\textcolor{wheat}}
```

```
\newcommand{\lightbrownishgray}    {\textcolor{lightbrownishgray}}
\newcommand{\lightbrownishgrey}    {\textcolor{lightbrownishgrey}}
\newcommand{\peachpuff}            {\textcolor{peachpuff}}
```

Examples

cornsilk	\cornsilk{cornsilk}
navajowhite	\navajowhite{navajowhite}
wheat	\wheat{wheat}

lightbrownishgray	`\lightbrownishgray{lightbrownishgray}`
lightbrownishgrey	`\lightbrownishgray{lightbrownishgrey}`
peachpuff	`\peachpuff{peachpuff}`

Note here that, each of these `\newcommand`s require an argument. This means that you must put the text which you want to change the color in a curly parentheses `{ }`. If you forget to indicate that the whole text must be treated as one element, then only the first one letter will be changed.

Examples

red	`\red{red}`
red	`\red red`

Chapter 8

New Fonts

In my `clshan-font` package I defined all `\newfont`s which can be used in LaTeX(Section 8.1). I also defined a set of `\newcommand`s in order to use some special symbols defined *only* in these fonts (Section 8.2).

8.1 Definitions of the `\newfont`s

8.1.1 Computer modern fonts: upright and inclined fonts

I defined the following 5 `\newfont`s, but usually we only need the "`computer modern upright italics`" font, the other 4 fonts are just the usual `roman`, `italics`, `slanted`, and `small caps` fonts (`\rm`, `\it`, `\sl`, and `\sc`) in LaTeX.

Computer modern roman

```
\newfont{\cmrmx}                {cmr10}
\newfont{\cmrmxi}               {cmr10 scaled \magstephalf}
\newfont{\cmrmxii}              {cmr12}
```

Computer modern italics

```
\newfont{\cmitx}                {cmti10}
\newfont{\cmitxi}               {cmti10 scaled \magstephalf}
\newfont{\cmitxii}              {cmti12}
```

Computer modern upright italics

```
\newfont{\cmupitx}              {cmu10}
\newfont{\cmupitxi}             {cmu10 scaled \magstephalf}
\newfont{\cmupitxii}            {cmu10 scaled \magstep1}
```

Computer modern slanted roman

```
\newfont{\cmslrmx}              {cmsl10}
\newfont{\cmslrmxi}             {cmsl10 scaled \magstephalf}
\newfont{\cmslrmxii}            {cmsl12}
```

Computer modern caps and small caps

```
\newfont{\cmscx}                {cmcsc10}
\newfont{\cmscxi}               {cmcsc10 scaled \magstephalf}
\newfont{\cmscxii}              {cmcsc10 scaled \magstep1}
```

Here "cm" stands for "`computer modern`", "rm", "it", "sl", and "sc" stand for "`roman`", "`italics`", "`slanted`", and "`small caps`", "up" stands for "upright", and "x", "xi", and "xii" stand for the character size "10pt", "11pt", and "12pt".

Examples

`\cmrmx`	Computer modern roman (5, 6, 7, 8, 9, 10, 12, 17) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmitx`	*Computer modern italics (7, 8, 9, 10, 12)* *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z* *a b c d e f g h i j k l m n o p q r s t u v w x y z* *1 2 3 4 5 6 7 8 9 0*

`\cmupitx`	Computer modern upright italics (10) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmslrmx`	*Computer modern slanted roman (8, 9, 10, 12)* *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z* *a b c d e f g h i j k l m n o p q r s t u v w x y z* *1 2 3 4 5 6 7 8 9 0*

`\cmscx`	Computer modern caps and small caps (8, 9, 10) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 1 2 3 4 5 6 7 8 9 0

Here the numbers in the parentheses are the original design sizes (in unit of `pt`) in LaTeX.

8.1.2 Computer modern fonts: bold fonts

I defined the following 4 bold `\newfont`s. But the "`computer modern bold roman`" font (*not* the `computer modern bold` font) is just the usual `bold face` font (`\bf`) in LaTeX and the letters (*not the numbers*) in the "`computer modern bold italics`" font are the same as the letters in the usual `mathematical mode` under the `\boldmath` command, but there is no extra space between two neighbor letters, and the space between two words has been keep;

Computer modern bold

```
\newfont{\cmbfx}                {cmb10}
\newfont{\cmbfxi}               {cmb10 scaled \magstephalf}
\newfont{\cmbfxii}              {cmb10 scaled \magstep1}
```

Computer modern bold roman

```
\newfont{\cmbfrmx}              {cmbx10}
\newfont{\cmbfrmxi}             {cmbx10 scaled \magstephalf}
\newfont{\cmbfrmxii}            {cmbx12}
```

Computer modern bold italics

```
\newfont{\cmbfitx}              {cmbxti10}
\newfont{\cmbfitxi}             {cmbxti10 scaled \magstephalf}
\newfont{\cmbfitxii}            {cmbxti10 scaled \magstep1}
```

Computer modern bold slanted roman

```
\newfont{\cmbfslrmx}            {cmbxsl10}
\newfont{\cmbfslrmxi}           {cmbxsl10 scaled \magstephalf}
\newfont{\cmbfslrmxii}          {cmbxsl10 scaled \magstep1}
```

Here "bf" stands for "`bold face`".

Examples

`\cmbfx`	**Computer modern bold (10)** **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z** **a b c d e f g h i j k l m n o p q r s t u v w x y z** **1 2 3 4 5 6 7 8 9 0**
`\cmbfrmx`	**Computer modern bold roman (5, 6, 7, 8, 9, 10, 12)** **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z** **a b c d e f g h i j k l m n o p q r s t u v w x y z** **1 2 3 4 5 6 7 8 9 0**
`\cmbfitx`	***Computer modern bold italics (10)*** ***A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*** ***a b c d e f g h i j k l m n o p q r s t u v w x y z*** ***1 2 3 4 5 6 7 8 9 0***

`\cmbfslrmx`	***Computer modern bold slanted roman (10)***
	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
	a b c d e f g h i j k l m n o p q r s t u v w x y z
	1 2 3 4 5 6 7 8 9 0

8.1.3 Computer modern fonts: typewriter series

I defined the following 6 different typewriter `\newfont`s and the "`computer modern typewriter`" font is the usual `typewriter` font (`\tt`) in LaTeX.

Computer modern typewriter

```
\newfont{\cmttx}                {cmtt10}
\newfont{\cmttxi}               {cmtt10 scaled \magstephalf}
\newfont{\cmttxii}              {cmtt12}
```

Computer modern italic typewriter

```
\newfont{\cmitttx}              {cmitt10}
\newfont{\cmitttxi}             {cmitt10 scaled \magstephalf}
\newfont{\cmitttxii}            {cmitt10 scaled \magstep1}
```

Computer modern slanted typewriter

```
\newfont{\cmslttx}              {cmsltt10}
\newfont{\cmslttxi}             {cmsltt10 scaled \magstephalf}
\newfont{\cmslttxii}            {cmsltt10 scaled \magstep1}
```

Computer modern caps and small caps typewriter

```
\newfont{\cmscttx}              {cmtcsc10}
\newfont{\cmscttxi}             {cmtcsc10 scaled \magstephalf}
\newfont{\cmscttxii}            {cmtcsc10 scaled \magstep1}
```

Computer modern variable typewriter

```
\newfont{\cmvttx}               {cmvtt10}
\newfont{\cmvttxi}              {cmvtt10 scaled \magstephalf}
\newfont{\cmvttxii}             {cmvtt10 scaled \magstep1}
```

Computer modern typewriter extension

```
\newfont{\cmttexx}                {cmtex10}
\newfont{\cmttexxi}               {cmtex10 scaled \magstephalf}
\newfont{\cmttexxii}              {cmtex10 scaled \magstep1}
```

Here "tt" stands for "typewriter", "v" and "ex" stand for "variable" and "extension".

Examples

```
\cmttx          Computer modern typewriter (8, 9, 10, 12)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                a b c d e f g h i j k l m n o p q r s t u v w x y z
                1 2 3 4 5 6 7 8 9 0
```

```
\cmitttx        Computer modern italic typewriter (10)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                a b c d e f g h i j k l m n o p q r s t u v w x y z
                1 2 3 4 5 6 7 8 9 0
```

```
\cmslttx        Computer modern slanted typewriter (10)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                a b c d e f g h i j k l m n o p q r s t u v w x y z
                1 2 3 4 5 6 7 8 9 0
```

```
\cmscttx        Computer modern caps and small caps typewriter (10)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                1 2 3 4 5 6 7 8 9 0
```

```
\cmvttx         Computer modern variable typewriter (10)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                a b c d e f g h i j k l m n o p q r s t u v w x y z
                1 2 3 4 5 6 7 8 9 0
```

```
\cmttexx        Computer modern typewriter extension (8, 9, 10)
                A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
                a b c d e f g h i j k l m n o p q r s t u v w x y z
                1 2 3 4 5 6 7 8 9 0
```

8.1.4 Computer modern fonts: sans serif series

I defined the following 6 different sans serif \newfonts and the "computer modern sans serif" font is the usual sans serif font (\sf) in LaTeX.

Computer modern sans serif

```
\newfont{\cmsfx}                {cmss10}
\newfont{\cmsfxi}               {cmss10 scaled \magstephalf}
\newfont{\cmsfxii}              {cmss12}
```

Computer modern bold sans serif

```
\newfont{\cmbfsfx}              {cmssbx10}
\newfont{\cmbfsfxi}             {cmssbx10 scaled \magstephalf}
\newfont{\cmbfsfxii}            {cmssbx10 scaled \magstep1}
```

Computer modern semi-bold sans serif

```
\newfont{\cmsbfsfx}             {cmssdc10}
\newfont{\cmsbfsfxi}            {cmssdc10 scaled \magstephalf}
\newfont{\cmsbfsfxii}           {cmssdc10 scaled \magstep1}
```

Computer modern slanted sans serif

```
\newfont{\cmslsfx}              {cmssi10}
\newfont{\cmslsfxi}             {cmssi10 scaled \magstephalf}
\newfont{\cmslsfxii}            {cmssi12}
```

Computer modern sans serif quotation

```
\newfont{\cmsfqviii}            {cmssq8}
```

Computer modern sans serif quotation inclined

```
\newfont{\cmsfqiviii}           {cmssqi8}
```

Here "sf" stands for "`sans serif`", "sbf" stands for "semi-bold face", "q" and "qi" stand for "quotation" and "quotation inclined", and "viii" stand for the character size "8pt". Please note here that the "`computer modern sans serif quotation`" and the "`computer modern sans serif quotation inclined`" fonts have been defined *only for 8pt* and I *didn't* extended them to any other size.

Examples

`\cmsfx`	Computer modern sans serif (8, 9, 10, 12, 17) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmslsfx`	*Computer modern slanted sans serif (8, 9, 10, 12, 17)* *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z* *a b c d e f g h i j k l m n o p q r s t u v w x y z* *1 2 3 4 5 6 7 8 9 0*

`\cmbfsfx`	**Computer modern bold sans serif (10)** **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z** **a b c d e f g h i j k l m n o p q r s t u v w x y z** **1 2 3 4 5 6 7 8 9 0**

`\cmsbfsfx`	**Computer modern semi-bold sans serif (10)** **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z** **a b c d e f g h i j k l m n o p q r s t u v w x y z** **1 2 3 4 5 6 7 8 9 0**

`\cmsfqviii`	Computer modern sans serif quotation (8) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmsfqiviii`	*Computer modern sans serif quotation inclined (8)* *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z* *a b c d e f g h i j k l m n o p q r s t u v w x y z* *1 2 3 4 5 6 7 8 9 0*

8.1.5 Computer modern fonts: some funny fonts

Except the above serious fonts, I defined also the following 4 funny `\newfont`s:

Computer modern funny roman

```
\newfont{\cmfurmx}              {cmff10}
\newfont{\cmfurmxi}             {cmff10 scaled \magstephalf}
\newfont{\cmfurmxii}            {cmff10 scaled \magstep1}
```

Computer modern funny italics

```
\newfont{\cmfuitx}              {cmfi10}
\newfont{\cmfuitxi}             {cmfi10 scaled \magstephalf}
\newfont{\cmfuitxii}            {cmfi10 scaled \magstep1}
```

Computer modern Dunhill

```
\newfont{\cmdunx}                {cmdunh10}
\newfont{\cmdunxi}               {cmdunh10 scaled \magstephalf}
\newfont{\cmdunxii}              {cmdunh10 scaled \magstep1}
```

Computer modern Fibnocci

```
\newfont{\cmfibviii}             {cmfib8}
```

Here "fu", "dun", and "fib" stand for "funny, "Dunhill", and "Fibnocci". Please note here that the "`computer modern Fibnocci`" font have been defined *only for 8pt* and I *didn't* extended it to any other size.

Examples

`\cmfurmx`	Computer modern funny roman (10) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmfuitx`	*Computer modern funny italics (10)* *A B C D E F G H I J K L M N O P Q R S T U V W X Y Z* *a b c d e f g h i j k l m n o p q r s t u v w x y z* *1 2 3 4 5 6 7 8 9 0*

`\cmdunx`	Computer modern Dunhill (10) A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 1 2 3 4 5 6 7 8 9 0

`\cmfibviii`	**Computer modern Fibonacci (8)** A B C D E F G H I J K L M N O P Q R S T U V W X Y Z **a b c d e f g h i j k l m n o p q r s t u v w x y z** 1 2 3 4 5 6 7 8 9 0

8.1.6 Computer modern fonts: mathematical symbols

For some special mathematical use I defined the following 4 `\newfont`s.

The letters (*not the numbers*) in the "`computer modern mathematical italics`" font are the same as the letters in the usual `mathematical mode` but with less extra space between two neighbor letters, or the letters in the `italics` font with a tiny space between two neighbor letters, and the space between two words has been neglected; The letters (*not the numbers*) in the "`computer modern mathematical bold`" are the same as the letters in the usual `mathematical mode` under the `\boldmath` command but with less extra space between two neighbor letters, or the letters in the `computer modern bold italics` font with a tiny space between two neighbor letters, and the space between two words has been neglected.

On the other hand, the capital letters in the "`computer modern symbols`" or the "`computer modern bold symbols`" (there is *neither lowercase letter nor number*) are the same as the letters in the usual `mathematical mode` under the `\cal` (calligraph) command and without or with the `\boldmath` command.

Computer modern mathematical italics

```
\newfont{\cmmathitx}            {cmmi10}
\newfont{\cmmathitxi}           {cmmi10 scaled \magstephalf}
\newfont{\cmmathitxii}          {cmmi12}
```

Computer modern mathematical bold

```
\newfont{\cmmathbfx}            {cmmib10}
\newfont{\cmmathbfxi}           {cmmib10 scaled \magstephalf}
\newfont{\cmmathbfxii}          {cmmib10 scaled \magstep1}
```

Computer modern symbols

```
\newfont{\cmsyx}                {cmsy10}
\newfont{\cmsyxi}               {cmsy10 scaled \magstephalf}
\newfont{\cmsyxii}              {cmsy10 scaled \magstep1}
```

Computer modern bold symbols

```
\newfont{\cmbfsyx}              {cmbsy10}
\newfont{\cmbfsyxi}             {cmbsy10 scaled \magstephalf}
\newfont{\cmbfsyxii}            {cmbsy10 scaled \magstep1}
```

Here "math" and "sy" stand for "mathematical" and "symbol".

Examples

	Computer modern mathematical italics (10, 12)
`\cmmathitx`	*ABCDEFGHIJKLMNOPQRSTUVWXYZ*
	abcdefghijklmnopqrstuvwxyz
	1234567890

	Computer modern mathematical bold (10)
`\cmmathbfx`	***ABCDEFGHIJKLMNOPQRSTUVWXYZ***
	abcdefghijklmnopqrstuvwxyz
	1234567890

	Computer modern symbols (10)
`\cmsyx`	*ABCDEFGHIJKLMNOPQRSTUVWXYZ*

	Computer modern bold symbols (10)
`\cmbfsyx`	***ABCDEFGHIJKLMNOPQRSTUVWXYZ***

Here I put the commands in the *second* (instead of the first) line on the left side because the names of the `\newfont`s (e.g. *computer modern mathematical italics*) have not been typed in their own font, but in `italics` or `computer modern bold italics`.

8.1.7 AMS mathematical symbols

In order to use their special mathematical symbols I defined at first the "`AMS mathematical symbol A`" and the "`AMS mathematical symbol B`" `\newfont`s in the `clshan-font` package (See Sections 8.2.9 and 8.2.10).

AMS mathematical symbol A

```
\newfont{\amssyax}              {msam10}
\newfont{\amssyaxi}             {msam10 scaled \magstephalf}
\newfont{\amssyaxii}            {msam10 scaled \magstep1}
```

AMS mathematical symbol B

```
\newfont{\amssybx}              {msbm10}
\newfont{\amssybxi}             {msbm10 scaled \magstephalf}
\newfont{\amssybxii}            {msbm10 scaled \magstep1}
```

Example

	AMS mathematical symbol B (10)
`\amssybx`	$\mathbb{A}\ \mathbb{B}\ \mathbb{C}\ \mathbb{D}\ \mathbb{E}\ \mathbb{F}\ \mathbb{G}\ \mathbb{H}\ \mathbb{I}\ \mathbb{J}\ \mathbb{K}\ \mathbb{L}\ \mathbb{M}\ \mathbb{N}\ \mathbb{O}\ \mathbb{P}\ \mathbb{Q}\ \mathbb{R}\ \mathbb{S}\ \mathbb{T}\ \mathbb{U}\ \mathbb{V}\ \mathbb{W}\ \mathbb{X}\ \mathbb{Y}\ \mathbb{Z}$

Note here that there is *neither letters nor numbers* in the `AMS mathematical symbol A` font and in the `AMS mathematical symbol B` font there are *only the capital letters*. Hence I put the commands, `\amssybx`, in the *second* line on the left side in order to remind you that only the capital letters in the second line have been typed in the `AMS mathematical symbol B` font, but its name has been typed just in `roman`.

8.1.8 AMS Euler fonts

As Physicist I need sometimes some special calligraphic letters such like $\mathcal{E}$, $\mathcal{P}$, $\mathcal{L}$, or $\mathcal{S}$, to indicate some quantities (energy, momentum, angular momentum, spin, etc.). Hence I also defined the following 6 AMS Euler fonts:

AMS Euler roman

```
\newfont{\eurmx}                {eurm10}
\newfont{\eurmxi}               {eurm10 scaled \magstephalf}
\newfont{\eurmxii}              {eurm10 scaled \magstep1}
```

AMS Euler bold roman

```
\newfont{\eubfrmx}              {eurb10}
\newfont{\eubfrmxi}             {eurb10 scaled \magstephalf}
\newfont{\eubfrmxii}            {eurb10 scaled \magstep1}
```

AMS Euler fraktur

```
\newfont{\eufrx}                {eufm10}
\newfont{\eufrxi}               {eufm10 scaled \magstephalf}
\newfont{\eufrxii}              {eufm10 scaled \magstep1}
```

AMS Euler bold fraktur

```
\newfont{\eubffrx}              {eufb10}
\newfont{\eubffrxi}             {eufb10 scaled \magstephalf}
\newfont{\eubffrxii}            {eufb10 scaled \magstep1}
```

AMS Euler scripts

```
\newfont{\euspx}                {eusm10}
\newfont{\euspxi}               {eusm10 scaled \magstephalf}
\newfont{\euspxii}              {eusm10 scaled \magstep1}
```

AMS Euler bold scripts

```
\newfont{\eubfspx}              {eusb10}
\newfont{\eubfspxi}             {eusb10 scaled \magstephalf}
\newfont{\eubfspxii}            {eusb10 scaled \magstep1}
```

Here “eu” stands for “Euler”, “fr” and “sp” stand for “fraktur” and “scripts”.

Examples

```
\eurmx
```
AMS Euler roman (10)
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5 6 7 8 9 0

```
\eubfrmx
```
AMS Euler bold roman (10)
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5 6 7 8 9 0

```
\eufrx
```
AMS Euler fraktur (10)
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z
1 2 3 4 5 6 7 8 9 0

`\eubffrx`	**AMS Euler bold fraktur (10)** **A B C D E F G H I J K L M N O P Q R S T U V W X Y Z** **a b c d e f g h i j k l m n o p q r s t u v w x y z** **1 2 3 4 5 6 7 8 9 0**

	AMS Euler scripts (10)
`\euspx`	*A B C D E F G H I J K L M N O P Q R S T U V W X Y Z*

	AMS Euler bold scripts (10)
`\eubfspx`	***A B C D E F G H I J K L M N O P Q R S T U V W X Y Z***

Note that, in the `AMS Euler scripts` and `AMS Euler bold scripts` fonts there are *only the capital letters.*

8.1.9 Washington cyrillic fonts

Actually I have never need some slavic letters, but it is for sure not bad to define some `\newfont`s in a package for some people who perhaps needs them sometimes.

Washington cyrillic roman

```
\newfont{\wcrmx}                {wncyr10}
\newfont{\wcrmxi}               {wncyr10 scaled \magstephalf}
\newfont{\wcrmxii}              {wncyr10 scaled \magstep1}
```

Washington cyrillic bold

```
\newfont{\wcbfx}                {wncyb10}
\newfont{\wcbfxi}               {wncyb10 scaled \magstephalf}
\newfont{\wcbfxii}              {wncyb10 scaled \magstep1}
```

Washington cyrillic italics

```
\newfont{\wcitx}                {wncyi10}
\newfont{\wcitxi}               {wncyi10 scaled \magstephalf}
\newfont{\wcitxii}              {wncyi10 scaled \magstep1}
```

Washington cyrillic sans serif

```
\newfont{\wcsfx}                {wncyss10}
\newfont{\wcsfxi}               {wncyss10 scaled \magstephalf}
\newfont{\wcsfxii}              {wncyss10 scaled \magstep1}
```

Washington cyrillic caps and small caps

```
\newfont{\wcscx}                {wncysc10}
\newfont{\wcscxi}               {wncysc10 scaled \magstephalf}
\newfont{\wcscxii}              {wncysc10 scaled \magstep1}
```

Here "wncy" stands for "Washington cyrillic".

Examples

	Washington cyrillic roman (5, 6, 7, 8, 9, 10)
`\wcrmx`	А Б Ц Д Е Ф Г Х И Ј К Л М Н О П Ч Р С Т У В Щ Ш Ы З
	а б ц д е ф г х и ј к л м н о п ч р с т у в щ ш ы з

	Washington cyrillic bold (5, 6, 7, 8, 9, 10)
`\wcbfx`	**А Б Ц Д Е Ф Г Х И Ј К Л М Н О П Ч Р С Т У В Щ Ш Ы З**
	а б ц д е ф г х и ј к л м н о п ч р с т у в щ ш ы з

	Washington cyrillic italics (5, 6, 7, 8, 9, 10)
`\wcitx`	*А Б Ц Д Е Ф Г Х И Ј К Л М Н О П Ч Р С Т У В Щ Ш Ы З*
	а б ц д е ф г х и ј к л м н о п ч р с т у в щ ш ы з

	Washington cyrillic sans serif (8, 9, 10)
`\wcsfx`	А Б Ц Д Е Ф Г Х И Ј К Л М Н О П Ч Р С Т У В Щ Ш Ы З
	а б ц д е ф г х и ј к л м н о п ч р с т у в щ ш ы з

	Washington cyrillic Small Caps (10)
`\wcscx`	А Б Ц Д Е Ф Г Х И Ј К Л М Н О П Ч Р С Т У В Щ Ш Ы З
	а б ц д е ф г х и ј к л м н о п ч р с т у в щ ш ы з

Note that, in the `Washington cyrillic` fonts there is *no number* but *both of the capital and lowercase letters.*

8.2 Useful symbols in the `\newfonts`

Actually I defined the `\newfont`s in Section 8.1 because sometimes I need some special symbols such like $\lesssim$ and $\gtrsim$ in my equations or ♦ and ■ for the lists in my slides. Then I decided to find out all useful symbols in the usual LaTeX and its `\newfont`s.

8.2.1 `\symbol` command in LaTeX

As examples I give you here *all* symbols which you *can not type* just with using a simple command such like `\%` (%), `\dag` (†), `\ae` (æ) or `!‘` (¡) in LaTeX.

Examples

Γ	\symbol{0}	{’0}	{"0}
Δ	\symbol{1}	{’1}	{"1}
Θ	\symbol{2}	{’2}	{"2}
Λ	\symbol{3}	{’3}	{"3}
Ξ	\symbol{4}	{’4}	{"4}
Π	\symbol{5}	{’5}	{"5}
Σ	\symbol{6}	{’6}	{"6}
Υ	\symbol{7}	{’7}	{"7}
Φ	\symbol{8}	{’10}	{"8}
Ψ	\symbol{9}	{’11}	{"9}
Ω	\symbol{10}	{’12}	{"A}

ff	\symbol{11}	{’13}	{"B}
fi	\symbol{12}	{’14}	{"C}
fl	\symbol{13}	{’15}	{"D}
ffi	\symbol{14}	{’16}	{"E}
ffl	\symbol{15}	{’17}	{"F}

ı	\symbol{16}	{’20}	{"10}
ȷ	\symbol{17}	{’21}	{"11}

`	\symbol{18}	{’22}	{"12}
´	\symbol{19}	{’23}	{"13}
˝	\symbol{125}	{’175}	{"7D}

˙	\symbol{95}	{’137}	{"5F}
¨	\symbol{127}	{’177}	{"7F}
˚	\symbol{23}	{’27}	{"17}

ˇ	\symbol{20}	{’24}	{"14}
ˆ	\symbol{94}	{’136}	{"5E}
˘	\symbol{21}	{’25}	{"15}
¯	\symbol{22}	{’26}	{"16}
˜	\symbol{126}	{’176}	{"7E}

ˋ	\symbol{24}	{'30}	{"18}
˙	\symbol{32}	{'40}	{"20}

&	\symbol{38}	{'46}	{"26}
@	\symbol{64}	{'100}	{"40}
“	\symbol{92}	{'134}	{"5C}

Note here that, first, there are three different systems for the character numbers: decimal ({#}), octal ({'#}), and hexadecimal ({"#}) notations. In order to be a good reference I give you here and later the character numbers *in all three notations*. Second, although you can just use `$\Gamma$` or `\boldmath$\Lambda$` instead of `\symbol{0}` or `\bf\symbol{3}` to type Γ or **Λ**, you *can not* type the greek capital letters in other fonts (the other basic fonts designed in LaTeX or the `\newfont`s defined in Section 8.1), at least it is not easy... Therefore, I decided to give you also the character numbers of these greek capital letters above.

Examples

Γ	\rm \symbol{0}
Γ	\bf \symbol{0}
Γ	\it \symbol{0}
Γ	\sl \symbol{0}
Γ	\tt \symbol{0}
Γ	\sf \symbol{0}

ı	\rm \symbol{16}
ı	\bf \symbol{16}
ı	\it \symbol{16}
ı	\sl \symbol{16}
ı	\tt \symbol{16}
ı	\sf \symbol{16}

@	\rm \symbol{64}
@	\bf \symbol{64}
@	\it \symbol{64}
@	\sl \symbol{64}
@	\tt \symbol{64}
@	\sf \symbol{64}

8.2.2 Some exceptions in the typewriter, italics, and small caps fonts

In principal you can use all character numbers given in Section 8.2.1 in all basic designed fonts in LaTeX, namely, \rm, \bf, \it, \sl, \tt, and \sf, and get the symbols given as examples there, but there are *11 exceptions* in the "typewriter" font. Because most of them are pretty useful and in order to use them more convenient, I defined at first

Typewriter

```
\newcommand{\ttsym}          [1]  {\mbox{\tt \symbol{#1}}}
```

Note that I used the \mbox command here and the rest of this section in order to ensure that these symbols can be shown correctly in the math mode. As examples I give you here the exceptions in the "typewriter" font:

Examples

↑	\ttsym{11}	{'13}	{"B}
↓	\ttsym{12}	{'14}	{"C}
'	\ttsym{13}	{'15}	{"D}

¡	\ttsym{14}	{'16}	{"E}
¿	\ttsym{15}	{'17}	{"F}

{	\ttsym{123}	{'173}	{"7B}
}	\ttsym{125}	{'175}	{"7D}

␣	\ttsym{32}	{'40}	{"20}
_	\ttsym{95}	{'137}	{"5F}
\	\ttsym{92}	{'134}	{"5C}
|	\ttsym{124}	{'174}	{"7C}

Although the characters number 14 and 15 are also exceptions in the typewriter font, but you can actually type them easily by using \tt !‘ and \tt ?‘. On the other hand, there are also *2 exceptions* in the "italics" font:

Examples

£	\it \symbol{36}	{'44}	{"24}
&	\it \symbol{38}	{'46}	{"26}

and *5 exceptions* in the "small caps" font:

Examples

↑	\sc \symbol{11}	{'13}	{"B}
↓	\sc \symbol{12}	{'14}	{"C}
'	\sc \symbol{13}	{'15}	{"D}

¡	\sc \symbol{14}	{'16}	{"E}
¿	\sc \symbol{15}	{'17}	{"F}

8.2.3 Computer modern fonts: upright and inclined fonts

For all \newfonts defined in Section 8.1.1, I defined the following \newcommands in order to use their special symbols more convenient.

Computer modern roman

```
\newcommand{\cmrmsyma}        [1]  {\mbox{\cmrmx  \symbol{#1}}}
\newcommand{\cmrmsymb}        [1]  {\mbox{\cmrmxi \symbol{#1}}}
\newcommand{\cmrmsymc}        [1]  {\mbox{\cmrmxii\symbol{#1}}}
```

Computer modern italics

```
\newcommand{\cmitsyma}        [1]  {\mbox{\cmitx  \symbol{#1}}}
\newcommand{\cmitsymb}        [1]  {\mbox{\cmitxi \symbol{#1}}}
\newcommand{\cmitsymc}        [1]  {\mbox{\cmitxii\symbol{#1}}}
```

Computer modern upright italics

```
\newcommand{\cmupitsyma}      [1]  {\mbox{\cmupitx  \symbol{#1}}}
\newcommand{\cmupitsymb}      [1]  {\mbox{\cmupitxi \symbol{#1}}}
\newcommand{\cmupitsymc}      [1]  {\mbox{\cmupitxii\symbol{#1}}}
```

Computer modern slanted roman

```
\newcommand{\cmslrmsyma}      [1]  {\mbox{\cmslrmx  \symbol{#1}}}
\newcommand{\cmslrmsymb}      [1]  {\mbox{\cmslrmxi \symbol{#1}}}
\newcommand{\cmslrmsymc}      [1]  {\mbox{\cmslrmxii\symbol{#1}}}
```

Computer modern caps and small caps

```
\newcommand{\cmscsyma}        [1]  {\mbox{\cmscx  \symbol{#1}}}
\newcommand{\cmscsymb}        [1]  {\mbox{\cmscxi \symbol{#1}}}
\newcommand{\cmscsymc}        [1]  {\mbox{\cmscxii\symbol{#1}}}
```

Here "sym" stands for "symbol", "a", "b", and "c" indicate the size are "10pt", "11pt" and "12pt". Because the other four \newfonts are actually the same as \rm, \it, \sl, and \sc in LaTeX, I just give you the two exceptions in the "\it" font given in Section 8.2.2 as examples here to let you know what you can get when you use them; otherwise, you can use all character numbers of the useful symbols listed in Section 8.2.1 (with the 5 exceptions given in Section 8.2.2 for the three "\cmscsym-" commands).

Examples

£	\cmupitsyma{36}	{'44}	{"24}
&	\cmupitsyma{38}	{'46}	{"26}

8.2.4 Computer modern fonts: bold fonts

For all \newfonts defined in Section 8.1.2, I defined the following \newcommands in order to use their special symbols more convenient.

Computer modern bold

```
\newcommand{\cmbfsyma}       [1]  {\mbox{\cmbfx  \symbol{#1}}}
\newcommand{\cmbfsymb}       [1]  {\mbox{\cmbfxi \symbol{#1}}}
\newcommand{\cmbfsymc}       [1]  {\mbox{\cmbfxii\symbol{#1}}}
```

Computer modern bold roman

```
\newcommand{\cmbfrmsyma}     [1]  {\mbox{\cmbfrmx  \symbol{#1}}}
\newcommand{\cmbfrmsymb}     [1]  {\mbox{\cmbfrmxi \symbol{#1}}}
\newcommand{\cmbfrmsymc}     [1]  {\mbox{\cmbfrmxii\symbol{#1}}}
```

Computer modern bold italics

```
\newcommand{\cmbfitsyma}     [1]  {\mbox{\cmbfitx  \symbol{#1}}}
\newcommand{\cmbfitsymb}     [1]  {\mbox{\cmbfitxi \symbol{#1}}}
\newcommand{\cmbfitsymc}     [1]  {\mbox{\cmbfitxii\symbol{#1}}}
```

Computer modern slanted roman

```
\newcommand{\cmbfslrmsyma}   [1]  {\mbox{\cmbfslrmx  \symbol{#1}}}
\newcommand{\cmbfslrmsymb}   [1]  {\mbox{\cmbfslrmxi \symbol{#1}}}
\newcommand{\cmbfslrmsymc}   [1]  {\mbox{\cmbfslrmxii\symbol{#1}}}
```

Note here that, you can use all character numbers of the useful symbols listed in Section 8.2.1, but, the three "\cmbfitsym-" commands have the 2 exceptions given in Section 8.2.2 as in the "\it" font.

Examples

ff	\cmbfsyma{11}	{'13}	{"B}
fi	\cmbfsyma{12}	{'14}	{"C}
fl	\cmbfsyma{13}	{'15}	{"D}
ffi	\cmbfsyma{14}	{'16}	{"E}
ffl	\cmbfsyma{15}	{'17}	{"F}

ı	\cmbfslrmsyma{16}	{'20}	{"10}
ȷ	\cmbfslrmsyma{17}	{'21}	{"11}
&	\cmbfslrmsyma{38}	{'46}	{"26}
@	\cmbfslrmsyma{64}	{'100}	{"40}

£	\cmbfitsyma{36}	{'44}	{"24}
&	\cmbfitsyma{38}	{'46}	{"26}

8.2.5 Computer modern fonts: typewriter series

For all \newfonts defined in Section 8.1.3, I defined the following \newcommands in order to use their special symbols more convenient.

Computer modern typewriter

```
\newcommand{\cmttsyma}        [1]  {\mbox{\cmttx  \symbol{#1}}}
\newcommand{\cmttsymb}        [1]  {\mbox{\cmttxi \symbol{#1}}}
\newcommand{\cmttsymc}        [1]  {\mbox{\cmttxii\symbol{#1}}}
```

Computer modern italic typewriter

```
\newcommand{\cmitttsyma}      [1]  {\mbox{\cmitttx  \symbol{#1}}}
\newcommand{\cmitttsymb}      [1]  {\mbox{\cmitttxi \symbol{#1}}}
\newcommand{\cmitttsymc}      [1]  {\mbox{\cmitttxii\symbol{#1}}}
```

Computer modern slanted typewriter

```
\newcommand{\cmslttsyma}      [1]  {\mbox{\cmslttx  \symbol{#1}}}
\newcommand{\cmslttsymb}      [1]  {\mbox{\cmslttxi \symbol{#1}}}
\newcommand{\cmslttsymc}      [1]  {\mbox{\cmslttxii\symbol{#1}}}
```

Computer modern caps and small caps typewriter

```
\newcommand{\cmscttsyma}      [1]  {\mbox{\cmscttx  \symbol{#1}}}
\newcommand{\cmscttsymb}      [1]  {\mbox{\cmscttxi \symbol{#1}}}
\newcommand{\cmscttsymc}      [1]  {\mbox{\cmscttxii\symbol{#1}}}
```

Computer modern variable typewriter

```
\newcommand{\cmvttsyma}       [1]  {\mbox{\cmvttx  \symbol{#1}}}
\newcommand{\cmvttsymb}       [1]  {\mbox{\cmvttxi \symbol{#1}}}
\newcommand{\cmvttsymc}       [1]  {\mbox{\cmvttxii\symbol{#1}}}
```

Computer modern typewriter extension

```
\newcommand{\cmttexsyma}      [1]  {\mbox{\cmttexx  \symbol{#1}}}
\newcommand{\cmttexsymb}      [1]  {\mbox{\cmttexxi \symbol{#1}}}
\newcommand{\cmttexsymc}      [1]  {\mbox{\cmttexxii\symbol{#1}}}
```

Please note here that, first, you can use all character numbers of the useful symbols listed in Section 8.2.1 for the "`\cmttsym-`", "`\cmitttsym-`", "`\cmslttsym-`", "`\cmscttsym-`", and "`\cmvttsym-`" commands. Second, except the "`\cmvttsym-`" commands *having no exception*, the other `\cmttsym-`, `\cmitttsym-`, `\cmslttsym-`, and `\cmscttsym-` commands have the 11 exceptions given in Section 8.2.2 for the "`\ttsym`" command. Third, for the "`\cmitttsym-`" commands there are also the 2 exceptions given in Section 8.2.2 for the `\it` font.

Examples

↑	`\cmscttsyma{11}`	`{'13}`	`{"B}`
↓	`\cmscttsyma{12}`	`{'14}`	`{"C}`
'	`\cmscttsyma{13}`	`{'15}`	`{"D}`

¡	`\cmscttsyma{14}`	`{'16}`	`{"E}`
¿	`\cmscttsyma{15}`	`{'17}`	`{"F}`

{	`\cmslttsyma{123}`	`{'173}`	`{"7B}`
}	`\cmslttsyma{125}`	`{'175}`	`{"7D}`

␣	`\cmitttsyma{32}`	`{'40}`	`{"20}`
_	`\cmitttsyma{95}`	`{'137}`	`{"5F}`
\	`\cmitttsyma{92}`	`{'134}`	`{"5C}`
/	`\cmitttsyma{124}`	`{'174}`	`{"7C}`

£	\cmitttsyma{36}	{'44}	{"24}
℘	\cmitttsyma{38}	{'46}	{"26}

On the other hand, in the "computer modern typewriter extension" font there are pretty lots of useful mathematical symbols. As examples I give you them here:

Examples

α	\cmttexsyma{2}	{'2}	{"2}
β	\cmttexsyma{3}	{'3}	{"3}
γ	\cmttexsyma{9}	{'11}	{"9}
δ	\cmttexsyma{10}	{'12}	{"A}
∈	\cmttexsyma{6}	{'6}	{"6}
λ	\cmttexsyma{8}	{'10}	{"8}
π	\cmttexsyma{7}	{'7}	{"7}

↑	\cmttexsyma{11}	{'13}	{"B}
↓	\cmttexsyma{1}	{'1}	{"1}
←	\cmttexsyma{24}	{'30}	{"18}
→	\cmttexsyma{25}	{'31}	{"19}
↮	\cmttexsyma{23}	{'27}	{"17}

∧	\cmttexsyma{4}	{'4}	{"4}
∨	\cmttexsyma{31}	{'37}	{"1F}
≤	\cmttexsyma{28}	{'34}	{"1C}
≥	\cmttexsyma{29}	{'35}	{"1D}

≠	\cmttexsyma{26}	{'32}	{"1A}
≡	\cmttexsyma{30}	{'36}	{"1E}

⊃	\cmttexsyma{17}	{'21}	{"11}
⊂	\cmttexsyma{16}	{'20}	{"10}
∪	\cmttexsyma{19}	{'23}	{"13}
∩	\cmttexsyma{18}	{'22}	{"12}

∀	\cmttexsyma{20}	{'24}	{"14}
∃	\cmttexsyma{21}	{'25}	{"15}

±	\cmttexsyma{12}	{'14}	{"C}
⊕	\cmttexsyma{13}	{'15}	{"D}
⊗	\cmttexsyma{22}	{'26}	{"16}
◇	\cmttexsyma{27}	{'33}	{"1B}

∂	\cmttexsyma{15}	{'17}	{"F}
ϖ	\cmttexsyma{14}	{'16}	{"E}
∫	\cmttexsyma{127}	{'177}	{"7F}
¬	\cmttexsyma{5}	{'5}	{"5}

Moreover, among the character numbers of the special symbols listed in Section 8.2.1 and the exceptions in the basic designed `typewriter` font given in Section 8.2.2 which have not been used for the special symbols in the `computer modern typewriter extension` font there are *only 2* symbols which are different from the normal `typewriter` font:

Examples

·	\cmttexsyma{0}	{'0}	{"0}
	\cmttexsyma{32}	{'40}	{"20}

8.2.6 Computer modern fonts: sans serif series

For all `\newfont`s defined in Section 8.1.4, I defined the following `\newcommand`s in order to use their special symbols more convenient.

Computer modern sans serif

```
\newcommand{\cmsfsyma}        [1]  {\mbox{\cmsfx  \symbol{#1}}}
\newcommand{\cmsfsymb}        [1]  {\mbox{\cmsfxi \symbol{#1}}}
\newcommand{\cmsfsymc}        [1]  {\mbox{\cmsfxii\symbol{#1}}}
```

Computer modern bold sans serif

```
\newcommand{\cmbfsfsyma}      [1]  {\mbox{\cmbfsfx  \symbol{#1}}}
\newcommand{\cmbfsfsymb}      [1]  {\mbox{\cmbfsfxi \symbol{#1}}}
\newcommand{\cmbfsfsymc}      [1]  {\mbox{\cmbfsfxii\symbol{#1}}}
```

Computer modern Semi-bold sans serif

```
\newcommand{\cmsbfsfsyma}     [1]  {\mbox{\cmsbfsfx  \symbol{#1}}}
\newcommand{\cmsbfsfsymb}     [1]  {\mbox{\cmsbfsfxi \symbol{#1}}}
\newcommand{\cmsbfsfsymc}     [1]  {\mbox{\cmsbfsfxii\symbol{#1}}}
```

Computer modern slanted sans serif

```
\newcommand{\cmslsfsyma}      [1]  {\mbox{\cmslsfx  \symbol{#1}}}
\newcommand{\cmslsfsymb}      [1]  {\mbox{\cmslsfxi \symbol{#1}}}
\newcommand{\cmslsfsymc}      [1]  {\mbox{\cmslsfxii\symbol{#1}}}
```

Note here that I *didn't* defined `\newcommand`s for the "`computer modern sans serif quotation`" and the "`computer modern sans serif quotation inclined`" fonts. For all `\newcommand`s defined here you can use all character numbers of the useful symbols listed in Section 8.2.1 *with no exceptions*.

8.2.7 Computer modern fonts: some funny fonts

For all `\newfont`s defined in Section 8.1.5, I defined the following `\newcommand`s in order to use their special symbols more convenient.

Computer modern funny roman

```
\newcommand{\cmfurmsyma}      [1]  {\mbox{\cmfurmx  \symbol{#1}}}
\newcommand{\cmfurmsymb}      [1]  {\mbox{\cmfurmxi \symbol{#1}}}
\newcommand{\cmfurmsymc}      [1]  {\mbox{\cmfurmxii\symbol{#1}}}
```

Computer modern funny italics

```
\newcommand{\cmfuitsyma}      [1]  {\mbox{\cmfuitx  \symbol{#1}}}
\newcommand{\cmfuitsymb}      [1]  {\mbox{\cmfuitxi \symbol{#1}}}
\newcommand{\cmfuitsymc}      [1]  {\mbox{\cmfuitxii\symbol{#1}}}
```

Computer modern Dunhill

```
\newcommand{\cmdunsyma}       [1]  {\mbox{\cmdunx  \symbol{#1}}}
\newcommand{\cmdunsymb}       [1]  {\mbox{\cmdunxi \symbol{#1}}}
\newcommand{\cmdunsymc}       [1]  {\mbox{\cmdunxii\symbol{#1}}}
```

Note here that I *didn't* defined `\newcommand`s for the "`computer modern Fibnocci` font. For all `\newcommand`s defined here you can use all character numbers of the useful symbols listed in Section 8.2.1, but the three "`\cmfuitsym-`" commands have the 2 exceptions given in Section 8.2.2 as in the `\it` font.

Examples

𝔫	\cmfurmsyma{11}	{'13}	{"B}
𝔬	\cmfurmsyma{12}	{'14}	{"C}
𝔭	\cmfurmsyma{13}	{'15}	{"D}
𝔮	\cmfurmsyma{14}	{'16}	{"E}
𝔯	\cmfurmsyma{15}	{'17}	{"F}

𝒻𝒻	\cmfuitsyma{11}	{'13}	{"B}
𝒻𝒾	\cmfuitsyma{12}	{'14}	{"C}
𝒻𝓁	\cmfuitsyma{13}	{'15}	{"D}
𝒻𝒻𝒾	\cmfuitsyma{14}	{'16}	{"E}
𝒻𝒻𝓁	\cmfuitsyma{15}	{'17}	{"F}

ﬀ	\cmdunsyma{11}	{'13}	{"B}
ﬁ	\cmdunsyma{12}	{'14}	{"C}
ﬂ	\cmdunsyma{13}	{'15}	{"D}
ﬃ	\cmdunsyma{14}	{'16}	{"E}
ﬄ	\cmdunsyma{15}	{'17}	{"F}

£	\cmfuitsyma{36}	{'44}	{"24}
&	\cmfuitsyma{38}	{'46}	{"26}

8.2.8 Computer modern fonts: mathematical symbols

For all \newfonts defined in Section 8.1.6, I defined the following \newcommands in order to use their special symbols more convenient.

Computer modern mathematical italics

```
\newcommand{\cmmathitsyma}    [1]  {\mbox{\cmmathitx  \symbol{#1}}}
\newcommand{\cmmathitsymb}    [1]  {\mbox{\cmmathitxi \symbol{#1}}}
\newcommand{\cmmathitsymc}    [1]  {\mbox{\cmmathitxii\symbol{#1}}}
```

Computer modern mathematical bold

```
\newcommand{\cmmathbfsyma}    [1]  {\mbox{\cmmathbfx  \symbol{#1}}}
\newcommand{\cmmathbfsymb}    [1]  {\mbox{\cmmathbfxi \symbol{#1}}}
\newcommand{\cmmathbfsymc}    [1]  {\mbox{\cmmathbfxii\symbol{#1}}}
```

Computer modern symbols

```
\newcommand{\cmsysyma}        [1]  {\mbox{\cmsyx  \symbol{#1}}}
\newcommand{\cmsysymb}        [1]  {\mbox{\cmsyxi \symbol{#1}}}
\newcommand{\cmsysymc}        [1]  {\mbox{\cmsyxii\symbol{#1}}}
```

Computer modern bold symbols

```
\newcommand{\cmbfsysyma}      [1]  {\mbox{\cmbfsyx  \symbol{#1}}}
\newcommand{\cmbfsysymb}      [1]  {\mbox{\cmbfsyxi \symbol{#1}}}
\newcommand{\cmbfsysymc}      [1]  {\mbox{\cmbfsyxii\symbol{#1}}}
```

I give you the character numbers of the useful symbols under the "`\cmmathitsym-`" and the "`\cmmathbfsym-`" commands:

Examples

Γ	`\cmmathitsyma{0}`	`{'0}`	`{"0}`
Δ	`\cmmathitsyma{1}`	`{'1}`	`{"1}`
Θ	`\cmmathitsyma{2}`	`{'2}`	`{"2}`
Λ	`\cmmathitsyma{3}`	`{'3}`	`{"3}`
Ξ	`\cmmathitsyma{4}`	`{'4}`	`{"4}`
Π	`\cmmathitsyma{5}`	`{'5}`	`{"5}`
Σ	`\cmmathitsyma{6}`	`{'6}`	`{"6}`
Υ	`\cmmathitsyma{7}`	`{'7}`	`{"7}`
Φ	`\cmmathitsyma{8}`	`{'10}`	`{"8}`
Ψ	`\cmmathitsyma{9}`	`{'11}`	`{"9}`
Ω	`\cmmathitsyma{10}`	`{'12}`	`{"A}`

‹	`\cmmathitsyma{44}`	`{'54}`	`{"2C}`
›	`\cmmathitsyma{45}`	`{'55}`	`{"2D}`

⌢	`\cmmathitsyma{127}`	`{'177}`	`{"7F}`
→	`\cmmathitsyma{126}`	`{'176}`	`{"7E}`

Actually, you can also use the "`\cmitsym-`" or the "`\cmbfsym-`" commands instead of the "`\cmmathitsym-`" or the "`\cmmathbfsym-`" ones to type the greek capital letters. On the other hand, there is *no* special symbol which must be typed or can be typed only under the "`\cmsysym-`" and the "`\cmbfsysym-`" commands.

8.2.9 AMS mathematical symbols A

For the `AMS mathematical symbols A` font defined in Section 8.1.7, I defined the following `\newcommand`s in order to use its special symbols more convenient.

AMS Mathematical Symbol A

```
\newcommand{\amssyasyma}      [1]  {\mbox{\amssyax  \symbol{#1}}}
\newcommand{\amssyasymb}      [1]  {\mbox{\amssyaxi \symbol{#1}}}
\newcommand{\amssyasymc}      [1]  {\mbox{\amssyaxii\symbol{#1}}}
```

Examples

□	`\amssyasyma{3}`	`{'3}`	`{"3}`
■	`\amssyasyma{4}`	`{'4}`	`{"4}`
⊡	`\amssyasyma{0}`	`{'0}`	`{"0}`
⊟	`\amssyasyma{12}`	`{'14}`	`{"E}`
⊞	`\amssyasyma{1}`	`{'1}`	`{"1}`
⊠	`\amssyasyma{2}`	`{'2}`	`{"2}`

⊙	`\amssyasyma{125}`	`{'175}`	`{"7D}`
⊛	`\amssyasyma{126}`	`{'176}`	`{"7E}`
⊝	`\amssyasyma{127}`	`{'177}`	`{"7F}`

◁	`\amssyasyma{67}`	`{'103}`	`{"43}`
▷	`\amssyasyma{66}`	`{'102}`	`{"42}`
△	`\amssyasyma{77}`	`{'115}`	`{"4D}`
▽	`\amssyasyma{79}`	`{'117}`	`{"4F}`
⊴	`\amssyasyma{69}`	`{'105}`	`{"45}`
⊵	`\amssyasyma{68}`	`{'104}`	`{"44}`
◊	`\amssyasyma{6}`	`{'6}`	`{"6}`

◀	`\amssyasyma{74}`	`{'112}`	`{"4A}`
▶	`\amssyasyma{73}`	`{'111}`	`{"49}`
▲	`\amssyasyma{78}`	`{'116}`	`{"4E}`
▼	`\amssyasyma{72}`	`{'110}`	`{"48}`
♦	`\amssyasyma{7}`	`{'7}`	`{"7}`

⟝	\amssyasyma{27}	{’33}	{"1B}
⟼	\amssyasyma{26}	{’32}	{"1A}
↞	\amssyasyma{17}	{’21}	{"11}
↠	\amssyasyma{16}	{’20}	{"10}

↫	\amssyasyma{34}	{’42}	{"22}
↬	\amssyasyma{35}	{’43}	{"23}

⇝	\amssyasyma{32}	{’40}	{"20}
⇜⇝	\amssyasyma{33}	{’41}	{"21}

←	\amssyasyma{76}	{’114}	{"4C}
→	\amssyasyma{75}	{’113}	{"4B}

⇇	\amssyasyma{18}	{’22}	{"12}
⇉	\amssyasyma{19}	{’23}	{"13}
⇆	\amssyasyma{28}	{’34}	{"1C}
⇄	\amssyasyma{29}	{’35}	{"1D}
⇋	\amssyasyma{11}	{’13}	{"B}
⇌	\amssyasyma{10}	{’12}	{"A}

⇐	\amssyasyma{87}	{’127}	{"57}
⇛	\amssyasyma{86}	{’126}	{"56}

⇂	\amssyasyma{24}	{’30}	{"18}
↾	\amssyasyma{22}	{’26}	{"16}
⇃	\amssyasyma{25}	{’31}	{"19}
↿	\amssyasyma{23}	{’27}	{"17}
↰	\amssyasyma{30}	{’36}	{"1E}
↱	\amssyasyma{31}	{’37}	{"1F}

⇈	\amssyasyma{20}	{’24}	{"14}
⇊	\amssyasyma{21}	{’25}	{"15}

$\leqslant$	\amssyasyma{54}	{'66}	{"36}
$\geqslant$	\amssyasyma{62}	{'76}	{"3E}
$\nleqslant$	\amssyasyma{48}	{'60}	{"30}
$\ngeqslant$	\amssyasyma{49}	{'61}	{"31}

$\leqslant$	\amssyasyma{55}	{'67}	{"37}
$\geqslant$	\amssyasyma{63}	{'77}	{"3F}

$\eqslantless$	\amssyasyma{53}	{'65}	{"35}
$\eqslantgtr$	\amssyasyma{61}	{'75}	{"3D}

$\lesssim$	\amssyasyma{46}	{'56}	{"2E}
$\gtrsim$	\amssyasyma{38}	{'46}	{"26}
$\lessapprox$	\amssyasyma{47}	{'57}	{"2F}
$\gtrapprox$	\amssyasyma{39}	{'47}	{"27}

$\lessgtr$	\amssyasyma{81}	{'121}	{"51}
$\gtrless$	\amssyasyma{82}	{'122}	{"52}
$\lesseqgtr$	\amssyasyma{83}	{'123}	{"53}
$\gtreqless$	\amssyasyma{84}	{'124}	{"54}

$\lll$	\amssyasyma{110}	{'156}	{"6E}
$\ggg$	\amssyasyma{111}	{'157}	{"6F}

$\prec$	\amssyasyma{52}	{'64}	{"34}
$\succ$	\amssyasyma{60}	{'74}	{"3C}
$\preccurlyeq$	\amssyasyma{50}	{'62}	{"32}
$\succcurlyeq$	\amssyasyma{51}	{'63}	{"33}

$\precsim$	\amssyasyma{45}	{'55}	{"2D}
$\succsim$	\amssyasyma{37}	{'45}	{"25}

≵	\amssyasyma{102}	{’146}	{"66}
≺	\amssyasyma{103}	{’147}	{"67}

≘	\amssyasyma{90}	{’132}	{"5A}
≙	\amssyasyma{89}	{’131}	{"59}
≚	\amssyasyma{91}	{’133}	{"5B}

≑	\amssyasyma{43}	{’53}	{"2B}
≒	\amssyasyma{59}	{’73}	{"3B}
≓	\amssyasyma{58}	{’72}	{"3A}

≜	\amssyasyma{44}	{’54}	{"2C}
≗	\amssyasyma{36}	{’44}	{"24}
≠	\amssyasyma{80}	{’120}	{"50}

≎	\amssyasyma{108}	{’154}	{"6C}
≏	\amssyasyma{109}	{’155}	{"6D}
∝	\amssyasyma{95}	{’137}	{"5F}

⌜	\amssyasyma{112}	{’160}	{"70}
⌝	\amssyasyma{113}	{’161}	{"71}
⌞	\amssyasyma{120}	{’170}	{"78}
⌟	\amssyasyma{121}	{’171}	{"79}

⊐	\amssyasyma{65}	{’101}	{"41}
⊏	\amssyasyma{64}	{’100}	{"40}

≽	\amssyasyma{107}	{’153}	{"6B}
≼	\amssyasyma{106}	{’152}	{"6A}

⋑	\amssyasyma{99}	{’143}	{"63}
⋐	\amssyasyma{98}	{’142}	{"62}
⋓	\amssyasyma{100}	{’144}	{"64}
⋒	\amssyasyma{101}	{’145}	{"65}

⟲	\amssyasyma{8}	{’10}	{"A}
⟳	\amssyasyma{9}	{’11}	{"B}

⌣	\amssyasyma{96}	{’140}	{"60}
⌢	\amssyasyma{97}	{’141}	{"61}
∽	\amssyasyma{118}	{’166}	{"76}

⟍	\amssyasyma{104}	{’150}	{"68}
⟋	\amssyasyma{105}	{’151}	{"69}

▪	\amssyasyma{5}	{’5}	{"5}
⋱	\amssyasyma{42}	{’52}	{"2A}
∴	\amssyasyma{41}	{’51}	{"29}

⊩	\amssyasyma{13}	{’15}	{"D}
⊪	\amssyasyma{14}	{’16}	{"E}
⊨	\amssyasyma{15}	{’17}	{"F}

∠	\amssyasyma{92}	{’134}	{"5C}
∡	\amssyasyma{93}	{’135}	{"5D}
◁	\amssyasyma{94}	{’136}	{"5E}

®	\amssyasyma{114}	{’162}	{"72}
Ⓢ	\amssyasyma{115}	{’163}	{"73}

C	\amssyasyma{123}	{’173}	{"7B}
T	\amssyasyma{124}	{’174}	{"7C}
¥	\amssyasyma{85}	{’125}	{"55}

★	\amssyasyma{70}	{’106}	{"46}
✠	\amssyasyma{122}	{’172}	{"7A}

⊸	\amssyasyma{40}	{'50}	{"28}
⟆	\amssyasyma{71}	{'107}	{"47}
✓	\amssyasyma{88}	{'130}	{"58}
⫛	\amssyasyma{116}	{'164}	{"74}
⫞	\amssyasyma{117}	{'165}	{"75}

8.2.10 AMS mathematical symbols B

For the `AMS mathematical symbols B` font defined in Section 8.1.7, I defined the following `\newcommand`s in order to use its special symbols more convenient.

AMS Mathematical Symbol B

```
\newcommand{\amssybsyma}      [1]  {\mbox{\amssybx  \symbol{#1}}}
\newcommand{\amssybsymb}      [1]  {\mbox{\amssybxi \symbol{#1}}}
\newcommand{\amssybsymc}      [1]  {\mbox{\amssybxii\symbol{#1}}}
```

Examples

⋪	\amssybsyma{54}	{'66}	{"36}
⋫	\amssybsyma{55}	{'67}	{"37}
⋬	\amssybsyma{53}	{'65}	{"35}
⋭	\amssybsyma{52}	{'64}	{"34}

↚	\amssybsyma{56}	{'70}	{"38}
↛	\amssybsyma{57}	{'71}	{"39}
↮	\amssybsyma{61}	{'75}	{"3D}

⇍	\amssybsyma{58}	{'72}	{"3A}
⇏	\amssybsyma{59}	{'73}	{"3B}
⇎	\amssybsyma{60}	{'74}	{"3C}

≮	\amssybsyma{4}	{'4}	{"4}
≯	\amssybsyma{5}	{'5}	{"5}
≰	\amssybsyma{10}	{'12}	{"A}
≱	\amssybsyma{11}	{'13}	{"B}

$\not\preceq$	\amssybsyma{2}	{'2}	{"2}
$\not\succeq$	\amssybsyma{3}	{'3}	{"3}
$\not\eqslantless$	\amssybsyma{20}	{'24}	{"14}
$\not\eqslantgtr$	\amssybsyma{21}	{'25}	{"15}

$\lneq$	\amssybsyma{12}	{'14}	{"E}
$\gneq$	\amssybsyma{13}	{'15}	{"D}
$\precneq$	\amssybsyma{0}	{'0}	{"0}
$\succneq$	\amssybsyma{1}	{'1}	{"1}
$\lneqq$	\amssybsyma{8}	{'10}	{"A}
$\gneqq$	\amssybsyma{9}	{'11}	{"B}

$\precnsim$	\amssybsyma{18}	{'22}	{"12}
$\succnsim$	\amssybsyma{19}	{'23}	{"13}
$\lnsim$	\amssybsyma{26}	{'32}	{"1A}
$\gnsim$	\amssybsyma{27}	{'33}	{"1B}

$\nprec$	\amssybsyma{6}	{'6}	{"6}
$\nsucc$	\amssybsyma{7}	{'7}	{"7}
$\not\preceq$	\amssybsyma{14}	{'16}	{"E}
$\not\succeq$	\amssybsyma{15}	{'17}	{"F}
$\npreceq$	\amssybsyma{22}	{'26}	{"16}
$\nsucceq$	\amssybsyma{23}	{'27}	{"17}

$\precapprox$	\amssybsyma{119}	{'167}	{"77}
$\succapprox$	\amssybsyma{118}	{'166}	{"78}

$\precnapprox$	\amssybsyma{16}	{'20}	{"10}
$\succnapprox$	\amssybsyma{17}	{'21}	{"11}
$\lnapprox$	\amssybsyma{24}	{'30}	{"18}
$\gnapprox$	\amssybsyma{25}	{'31}	{"19}

$\not\supseteq$	\amssybsyma{43}	{'53}	{"2B}
$\not\subseteq$	\amssybsyma{42}	{'52}	{"2A}
$\supsetneqq$	\amssybsyma{35}	{'43}	{"23}
$\subsetneqq$	\amssybsyma{34}	{'42}	{"22}

$\supsetneq$	\amssybsyma{41}	{'51}	{"29}
$\subsetneq$	\amssybsyma{40}	{'50}	{"28}
$\supseteqq$	\amssybsyma{33}	{'41}	{"21}
$\subseteqq$	\amssybsyma{32}	{'40}	{"20}

$\gneqq$	\amssybsyma{37}	{'45}	{"25}
$\lneqq$	\amssybsyma{36}	{'44}	{"24}
$\gneqq$	\amssybsyma{39}	{'47}	{"27}
$\lneqq$	\amssybsyma{38}	{'46}	{"26}

$\sim$	\amssybsyma{115}	{'163}	{"73}
$\nsim$	\amssybsyma{28}	{'34}	{"1C}

$\approx$	\amssybsyma{116}	{'164}	{"74}
$\simeq$	\amssybsyma{104}	{'150}	{"68}

$\cong$	\amssybsyma{117}	{'165}	{"75}
$\ncong$	\amssybsyma{29}	{'35}	{"1D}

$\nmid$	\amssybsyma{45}	{'55}	{"2D}
$\nparallel$	\amssybsyma{44}	{'54}	{"2C}

$\shortmid$	\amssybsyma{112}	{'160}	{"70}
$\shortparallel$	\amssybsyma{113}	{'161}	{"71}
$\nshortmid$	\amssybsyma{46}	{'56}	{"2E}
$\nshortparallel$	\amssybsyma{47}	{'57}	{"2F}

⊬	\amssybsyma{48}	{'60}	{"30}
⊮	\amssybsyma{49}	{'61}	{"31}
⊭	\amssybsyma{50}	{'62}	{"32}
⊯	\amssybsyma{51}	{'63}	{"33}

⟋	\amssybsyma{30}	{'36}	{"1E}
⟍	\amssybsyma{31}	{'37}	{"1F}
⟍	\amssybsyma{114}	{'162}	{"72}

⪇	\amssybsyma{108}	{'154}	{"6C}
⪈	\amssybsyma{109}	{'155}	{"6D}

∝	\amssybsyma{110}	{'156}	{"6E}
⋋	\amssybsyma{111}	{'157}	{"6F}

↶	\amssybsyma{120}	{'170}	{"78}
↷	\amssybsyma{121}	{'171}	{"79}

∃	\amssybsyma{96}	{'140}	{"60}
∋	\amssybsyma{97}	{'141}	{"61}
𝐹	\amssybsyma{122}	{'172}	{"7A}
𝕜	\amssybsyma{124}	{'174}	{"7C}
ℏ	\amssybsyma{125}	{'175}	{"7D}
∍	\amssybsyma{127}	{'177}	{"7F}

ב	\amssybsyma{105}	{'151}	{"69}
ג	\amssybsyma{106}	{'152}	{"6A}
ך	\amssybsyma{107}	{'153}	{"6B}

♯	\amssybsyma{64}	{'100}	{"40}
ʊ	\amssybsyma{102}	{'146}	{"66}
ð	\amssybsyma{103}	{'147}	{"67}

⋇	\amssybsyma{62}	{'76}	{"3E}
∅	\amssybsyma{63}	{'77}	{"3F}
⌅	\amssybsyma{123}	{'173}	{"7B}

⌒	\amssybsyma{91}	{'133}	{"5B}
⌒	\amssybsyma{92}	{'134}	{"5C}
~	\amssybsyma{93}	{'135}	{"5D}
~	\amssybsyma{94}	{'136}	{"5E}

8.2.11 AMS Euler fonts

For all \newfonts defined in Section 8.1.8, I defined the following \newcommands in order to use their special symbols more convenient.

AMS Euler roman

```
\newcommand{\eurmsyma}      [1]  {\mbox{\eurmx  \symbol{#1}}}
\newcommand{\eurmsymb}      [1]  {\mbox{\eurmxi \symbol{#1}}}
\newcommand{\eurmsymc}      [1]  {\mbox{\eurmxii\symbol{#1}}}
```

AMS Euler bold roman

```
\newcommand{\eubfrmsyma}    [1]  {\mbox{\eubfrmx  \symbol{#1}}}
\newcommand{\eubfrmsymb}    [1]  {\mbox{\eubfrmxi \symbol{#1}}}
\newcommand{\eubfrmsymc}    [1]  {\mbox{\eubfrmxii\symbol{#1}}}
```

AMS Euler fraktur

```
\newcommand{\eufrsyma}      [1]  {\mbox{\eufrx  \symbol{#1}}}
\newcommand{\eufrsymb}      [1]  {\mbox{\eufrxi \symbol{#1}}}
\newcommand{\eufrsymc}      [1]  {\mbox{\eufrxii\symbol{#1}}}
```

AMS Euler bold fraktur

```
\newcommand{\eubffrsyma}    [1]  {\mbox{\eubffrx  \symbol{#1}}}
\newcommand{\eubffrsymb}    [1]  {\mbox{\eubffrxi \symbol{#1}}}
\newcommand{\eubffrsymc}    [1]  {\mbox{\eubffrxii\symbol{#1}}}
```

AMS Euler scripts

```
\newcommand{\euspsyma}       [1]  {\mbox{\euspx  \symbol{#1}}}
\newcommand{\euspsymb}       [1]  {\mbox{\euspxi \symbol{#1}}}
\newcommand{\euspsymc}       [1]  {\mbox{\euspxii\symbol{#1}}}
```

AMS Euler bold scripts

```
\newcommand{\eubfspsyma}     [1]  {\mbox{\eubfspx  \symbol{#1}}}
\newcommand{\eubfspsymb}     [1]  {\mbox{\eubfspxi \symbol{#1}}}
\newcommand{\eubfspsymc}     [1]  {\mbox{\eubfspxii\symbol{#1}}}
```

8.2.12 Washington cyrillic fonts

For all \newfonts defined in Section 8.1.9, I defined the following \newcommands in order to use their special symbols more convenient.

Washington cyrillic roman

```
\newcommand{\wcrmsyma}       [1]  {\mbox{\wcrmx  \symbol{#1}}}
\newcommand{\wcrmsymb}       [1]  {\mbox{\wcrmxi \symbol{#1}}}
\newcommand{\wcrmsymc}       [1]  {\mbox{\wcrmxii\symbol{#1}}}
```

Washington cyrillic bold

```
\newcommand{\wcbfsyma}       [1]  {\mbox{\wcbfx  \symbol{#1}}}
\newcommand{\wcbfsymb}       [1]  {\mbox{\wcbfxi \symbol{#1}}}
\newcommand{\wcbfsymc}       [1]  {\mbox{\wcbfxii\symbol{#1}}}
```

Washington cyrillic italics

```
\newcommand{\wcitsyma}       [1]  {\mbox{\wcitx  \symbol{#1}}}
\newcommand{\wcitsymb}       [1]  {\mbox{\wcitxi \symbol{#1}}}
\newcommand{\wcitsymc}       [1]  {\mbox{\wcitxii\symbol{#1}}}
```

Washington cyrillic sans serif

```
\newcommand{\wcsfsyma}       [1]  {\mbox{\wcsfx  \symbol{#1}}}
\newcommand{\wcsfsymb}       [1]  {\mbox{\wcsfxi \symbol{#1}}}
\newcommand{\wcsfsymc}       [1]  {\mbox{\wcsfxii\symbol{#1}}}
```

Washington cyrillic caps and small caps

```
\newcommand{\wcscsyma}        [1]  {\mbox{\wcscx  \symbol{#1}}}
\newcommand{\wcscsymb}        [1]  {\mbox{\wcscxi \symbol{#1}}}
\newcommand{\wcscsymc}        [1]  {\mbox{\wcscxii\symbol{#1}}}
```

Examples

Љ	\wcrmsyma{1}	{'1}	{"1}
љ	\wcrmsyma{9}	{'11}	{"9}
Њ	\wcrmsyma{0}	{'0}	{"0}
њ	\wcrmsyma{8}	{'10}	{"8}
Ю	\wcrmsyma{16}	{'20}	{"10}
ю	\wcrmsyma{24}	{'30}	{"18}

Ь	\wcrmsyma{94}	{'136}	{"5E}
Ћ	\wcrmsyma{35}	{'43}	{"23}
ь	\wcrmsyma{126}	{'176}	{"7E}
ћ	\wcrmsyma{43}	{'53}	{"2B}
Ъ	\wcrmsyma{95}	{'137}	{"5F}
ъ	\wcrmsyma{127}	{'177}	{"7F}

Ѣ	\wcrmsyma{6}	{'6}	{"6}
ђ	\wcrmsyma{14}	{'16}	{"E}
Ђ	\wcrmsyma{7}	{'7}	{"7}
ђ	\wcrmsyma{15}	{'17}	{"F}

Э	\wcrmsyma{3}	{'3}	{"3}
э	\wcrmsyma{11}	{'13}	{"B}
Є	\wcrmsyma{5}	{'5}	{"5}
є	\wcrmsyma{13}	{'15}	{"D}

Ц	\wcrmsyma{2}	{'2}	{"2}
ц	\wcrmsyma{10}	{'12}	{"A}
Я	\wcrmsyma{23}	{'27}	{"17}
я	\wcrmsyma{31}	{'37}	{"1F}

Ѫ	\wcrmsyma{17}	{’21}	{"11}
ѫ	\wcrmsyma{25}	{’31}	{"19}
Ѝ	\wcrmsyma{18}	{’22}	{"12}
ѝ	\wcrmsyma{26}	{’32}	{"1A}

Ѵ	\wcrmsyma{20}	{’24}	{"14}
ѵ	\wcrmsyma{28}	{’34}	{"1C}
~~Ѳ~~	\wcrmsyma{21}	{’25}	{"15}
~~ѳ~~	\wcrmsyma{29}	{’35}	{"1B}

I	\wcrmsyma{4}	{’4}	{"4}
i	\wcrmsyma{12}	{’14}	{"C}
Ё	\wcrmsyma{19}	{’23}	{"13}
ё	\wcrmsyma{27}	{’33}	{"1B}
S	\wcrmsyma{22}	{’26}	{"16}
s	\wcrmsyma{30}	{’36}	{"1E}

№	\wcrmsyma{125}	{’175}	{"7D}

Chapter 9

Miscellaneous

In this section I will give you some \newcommands which I defined for some special aims, e.g. for this User's Guide. Due to their *non-generality* I *didn't* put them in my packages. But I think the ideas are also interesting and very useful. Hence, I decided to put them here.

9.1 \newcommands used in this User's Guide

I used some special \newcommands for this User's Guide. I will give you *all of* my definitions and I think it is not difficult for you to find the corresponding examples (all of them?).

Definitions

```
\newcommand{\tabt}          [3]  {\begin{flushleft}
                                   \vspace{0.3cm}
                                   {\bf #1} \\
                                   \vspace{0.3cm}
                                   \renewcommand{\arraystretch}{#2}
                                   \begin{tabular}{#3}
                                   \hline}
```

```
\newcommand{\tabb}                 {\hline
                                    \end{tabular}
                                    \vspace{0.3cm}
                                    \end{flushleft}}
```

```
\newcommand{\tabc}          [3]  {\tabb
                                   \vspace{-1cm}
                                   \tabt{#1}{#2}{#3}}
```

Here the "t", "b", and "c" stand for "top", "bottom", and "connect".

Definitions

```
\newcommand{\deft}              {\tabt{Definition} {1.8}{|p{4.45cm} p{0.5cm} p{10.75cm}|}}
\newcommand{\defst}             {\tabt{Definitions}{1.8}{|p{4.45cm} p{0.5cm} p{10.75cm}|}}
\newcommand{\defsc}             {\tabc{~}          {1.8}{|p{4.45cm} p{0.5cm} p{10.75cm}|}}
```

```
\newcommand{\defmat}          {\tabt{Definition} {1.3}{|p{4.5 cm} p{0.5cm} p{10.7 cm}|}}
\newcommand{\defmast}         {\tabt{Definitions}{1.3}{|p{4.5 cm} p{0.5cm} p{10.7 cm}|}}
\newcommand{\defmasc}         {\tabc{~}          {1.3}{|p{4.5 cm} p{0.5cm} p{10.7 cm}|}}
```

```
\newcommand{\defbmt}          {\tabt{Definition} {1.3}{|p{5.2 cm} p{0.5cm} p{10   cm}|}}
\newcommand{\defbmst}         {\tabt{Definitions}{1.3}{|p{5.2 cm} p{0.5cm} p{10   cm}|}}
\newcommand{\defbmsc}         {\tabc{~}          {1.3}{|p{5.2 cm} p{0.5cm} p{10   cm}|}}
```

```
\newcommand{\defct}           {\tabt{Definition} {1.3}{|p{5   cm} p{0.5cm} p{10.2 cm}|}}
\newcommand{\defcst}          {\tabt{Definitions}{1.3}{|p{5   cm} p{0.5cm} p{10.2 cm}|}}
\newcommand{\defcsc}          {\tabc{~}          {1.3}{|p{5   cm} p{0.5cm} p{10.2 cm}|}}
```

Here “def”, “ma”, “bm”, and “c” stand for “definition”, “matrix”, “beamer”, “color”, and “-s” stands for the plural of a noun.

Definitions

```
\newcommand{\ext}         [1]  {\tabt{Example} {#1}{|p{2.5cm} p{6cm}|}}
\newcommand{\exst}        [1]  {\tabt{Examples}{#1}{|p{2.5cm} p{6cm}|}}
\newcommand{\exsc}        [1]  {\tabc{~}       {#1}{|p{2.5cm} p{6cm}|}}
```

```
\newcommand{\exbmt}       [1]  {\tabt{Example} {#1}{|p{16.55cm}|}}
\newcommand{\exbmst}      [1]  {\tabt{Examples}{#1}{|p{16.55cm}|}}
\newcommand{\exbmsc}      [1]  {\tabc{~}       {#1}{|p{16.55cm}|}}
```

```
\newcommand{\exfontt}     [1]  {\tabt{Example} {#1}{|p{2.5cm} p{13.6cm}|}}
\newcommand{\exfontst}    [1]  {\tabt{Examples}{#1}{|p{2.5cm} p{13.6cm}|}}
\newcommand{\exfontsc}    [1]  {\tabc{~}       {#1}{|p{2.5cm} p{13.6cm}|}}
```

Here “ex” stands for “example” and “font” stands just for “font”.

Definitions

```
\newcommand{\argst}           {\tabt{Arguments}{1.3}{|p{8.925cm}|}}
```

```
\newcommand{\mast}            {\vspace{-1cm} \tabt{~}{1.1}{|p{5cm} p{3.5cm}|}}
\newcommand{\masc}            {              \tabc{~}{1.1}{|p{5cm} p{3.5cm}|}}
```

```
\newcommand{\fontt}        [1]  {              \tabt{\rm #1}{1.8}{|p{5  cm} p{0.5cm} p{10.2cm}|}}
\newcommand{\fontc}        [1]  {\vspace{-0.5cm} \tabt{\rm #1}{1.8}{|p{5  cm} p{0.5cm} p{10.2cm}|}}
```

Here "arg" stands for "argument".

Definitions

```
\newcommand{\mb}           [1]  {\makebox[2.5cm][c]{$\displaystyle #1 $}}
\newcommand{\mbtext}       [1]  {\makebox[2.5cm][c]{#1}}
\newcommand{\cb}           [1]  {~#1 &
                                  \colorbox{#1}{\textcolor{#1}{boooooooooooy}}~~~
                                  \textcolor{#1}{#1}}
```

Here "mb" and "cb" stand for "makebox" and "colorbox", respectively.

Definitions

```
\newcommand{\Caps}             {A B C D E F G H I J K L M N O P Q R S T U V W X Y Z}
\newcommand{\atoz}             {a b c d e f g h i j k l m n o p q r s t u v w x y z}
\newcommand{\Nums}             {1 2 3 4 5 6 7 8 9 0}
```

```
\newcommand{\Cm}               {Computer modern }
\newcommand{\cm}               {computer modern }
\newcommand{\AMSE}             {AMS Euler }
\newcommand{\Wc}               {Washington cyrillic }
```

9.2 \ignore and \switch

If you typed a long text but don't want to use for a while, you can use a % or even lots of % to set this paragraph as a comment. But it is certainly a better idea to use a command such like `\ignore` to let the typeset-program *ignore* this text. Then you can save pretty much time in which you type and delete the %s.

Definition

```
\def \ignore#1 {}
```

Note that, first, it is necessary to use the `\def` command for this aim. You can not use a command such like `\newcommand{\ignore}[1]{}`. Because You want to send something (as the argument #1) to nothing, and if you use the command `\newcommand{\ignore}[1]{}`, *nothing* has been defined as the argument #1. Then the typeset-program will send an error massage to you... Second, if you have some bugs in the text (for example, a `}` more), you can not use this `\ignore` command! Because your typeset-program can not find the corresponding `}` for the `\ignore{`. On the other hand, you could need to change something from two or more choices. For example, I prepared my three talks with students of different levels at once. Hence I gave different titles for the same context. Or, when I wrote the text of my slides, I had to use the `\picframe` command instead of the `\imagein` in order to protect my old notebook... I can write two choices of one section title one after the other and use the % to pick up the other one which I want to use every time. But, it is for sure better to define a command such like

Definition

```
\newcommand{\switch}       [2]  {#1}
```

Then I just need to change the number of the argument (#1, #2, or even #3) in my preamble, I can change all of the alternative parts at once.

Acknowledgments

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